THE AMERICAN GAS LIGHT JOURNAL

REDMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 42 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, HEATING, MECHANICAL, CHEMICAL AND GENERAL SCIENCE.

VOLUME LXXXII. No. 5. Whole No. 1,547. | NEW YORK, MONDAY, JANUARY 30, 1905. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager. THOMAS J. CUNNINGHAM and ELBERT P. CALLENDER, Editors.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

Published on each Monday of the year, at No. 42 Pine Street, New York.

Telephone.—2996 John.

The American News Company, Nos. 39 and 41 Chambers street, New York, are agents for this JOURNAL. Newsdealers will send orders to them.

Terms of Subscription, Including Postage.—For the United States and Canada, $3 per annum. European countries, $5 (£1—25 francs). All payments to be made in advance. Single copies, 10 cents.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Thirty-fifth Annual Meeting, New England Association of Gas Engineers.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS,
EAST BOSTON, MASS., Jan. 10, 1905.

To the Members of the New England Association of Gas Engineers: The Thirty-fifth annual meeting of the New England Association of Gas Engineers will be held at Young's Hotel, Boston, Wednesday and Thursday, February 15th and 16th, 1905. Those of our members who have changed their addresses will confer a favor on the Secretary by notifying him of such changes, so that they may have proper notification of the meeting.

Queries for the Question Box at the meeting should be forwarded at once. Respectfully, N. W. GIFFORD, Secretary.

[OFFICIAL NOTICE.]

Respecting the Official Work of the American Gas Light Association.

AMERICAN GAS LIGHT ASSOCIATION,
SECRETARY'S OFFICE,
530 Broadway, N. Y., Dec. 13, 1904.

To the Members American Gas Light Association: As there seems to be some misunderstanding respecting the standing of the official management of the Association, members will please note that the undersigned is the Secretary of the Association, and that Mr. A. E. Forstall is carrying forward the work of the Practical Class. All correspondence in connection with the Practical Class should therefore be addressed to Mr. A. E. Forstall, 58 William street, and all other matter pertaining to the Association to MR. GEORGE G. RAMSDELL, Secretary, at the above address.

[OFFICIAL NOTICE.]

Wrinkle Department, Ohio Gas Light Association.

OHIO GAS LIGHT ASSOCIATION,
OFFICE OF SECRETARY,
DELAWARE, O., Nov. 21, 1904.

The Editor of the Wrinkle Department, Mr. E. E. Eysenbach, General Manager of the Binghamton (N. Y.) Gas Company, earnestly solicits the co-operation of the fraternity for contributions to be presented to the Twenty-first Annual Meeting of the Association, which is to be held at the Hotel Schenley, Pittsburg, Pa., March 15th, 16th and 17th, 1905.

Editor Eysenbach will be pleased to receive contributions not later than February 10th. Work for the good of the cause and send him your "Wrinkles." T. C. JONES, Secretary.

[OFFICIAL NOTICE.]

Novelty Advertising and New Business Methods Department, Ohio Gas Light Association.

SECRETARY'S OFFICE,
DELAWARE, O., January 16, 1905.

The Editor of the Novelty Advertising and New Business Methods Department, Mr. B. W. Perkins, of South Bend, Ind., desires to announce that his department is now open for contributions to be presented at the Twenty-first Annual Meeting, which is to be held at the Hotel Schenley, Pittsburg, Pa., March 15th, 16th and 17th, 1905.

The sale of gas is one of the most important branches of our industry and this department is one of the most attractive features of the convention. It is, therefore, earnestly hoped that the fraternity will heartily co-operate with Mr. Perkins, and send him advertising and new business method schemes. T. C. JONES, Secretary.

[OFFICIAL NOTICE.]

Bureau of Information, Ohio Gas Light Association.

CITY OF LINCOLN GAS CO.,
LINCOLN, ILLS., Oct. 10, 1904.

To the Fraternity: At the last meeting of the Ohio Gas Light Association a Bureau of Information was decided upon, the idea of which is to render assistance to members who may have questions coming up or difficulties arising respecting which they would like some help. This Bureau has been established and is now ready for business. A number of co-Editors have been appointed to whom the various questions will be referred. As this is the first Bureau of Information attempted by any Association, it is hoped that the members will take advantage of its opportunities. The co-Editors are as follows:

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Distribution.—E. E. Eysenbach and M. E. Malone.
Accounts and Bookkeeping.—D. W. Low and Chas. Ritter.
New Business and Gas Appliances.—Frank D. Moses, Ralph Woodward and F. Cavanagh.
Chemistry —H. B. Harrop and Clarence Lomax.
Retort House.—Moses Coombs.
Natural Gas.—W. H. Hammon and Geo. W. Barnes.

All questions should be addressed to the Editor, at Lincoln, Ills.

Very truly yours,
H. L. OLDS, Editor Information Bureau.

BRIEFLY TOLD.

EXPRESS YOUR OPINION.—Mr. Fred. H. Shelton, ex-President of the Western Gas Association, has distributed the following letter to those concerned. It speaks for itself. Send your replies to him at his address, Pennsylvania Building, Philadelphia, Pa.:

"The exhibit of gas machinery, appliances, etc., made by the Western Gas Association at the St. Louis Exposition, having ended, the entire matter is being closed.

"You will remember it was stated that bronze medals would be issued by the Association as a souvenir to those contributing, either in exhibits or contributions towards its success. The time has come for this. Some of those interested, however, have suggested that a medal, while interesting in itself, is not very practical for those who wish to have it where it can be conveniently seen, as, being small, it is apt to be put in a drawer or cabinet. The suggestion has been made that an attractive certificate, which could be framed, would be generally preferred. There are about 50 who loaned apparatus, and something more than this number who contributed funds to the Exhibit, and are, therefore, in interest, and it is felt that the best way to find out which would be preferred is to ask, letting the majority of the replies received decide.

"Will you kindly advise me whether you would prefer a bronze medal about 2½ inches diameter, suitably worded and embossed, or a lithographed, attractive certificate for framing purposes."

NOTES—

MR. W. H. RIBLETT, formerly connected with the engineering staff of the Consolidated Gas Company, of New York, has been appointed Superintendent of the Vineland (N. J.) Light and Power Company.

"O. R. M.," writing from Chicago under date of the 24th inst., says: "It may probably interest your numerous readers to hear what is being done in the 'Windy City.' There are at present 45,000 gas arc lamps in daily use here, 92 per cent. of which are of the Humphreys' type, and the good work of installing the lamps goes steadily on. If there are still some doubters down your way, or for that matter anywhere else on earth, they should by all means come here; for seeing is believing. To see gas arc lamps in their glory would make any gas man feel elated. Take, for instance, Milwaukee avenue. That business street of all nations, has, for a distance of 5 miles, on both of its sides, hundreds of arc lamps showing to their best advantage. Quite often you see many 'A beautiful pair' on this cosmopolitan business thoroughfare. The success of the Humphrey arc is due to its great popularity, and in the above mentioned district a great deal of the result may be traced to the ever tireless efforts of a champion of solicitors, Mr. E. * * *."

"R.," writing from Cleveland, O., under date of the 25th inst., says: Dear JOURNAL: The inhabitants of cities who have been obliged to depend on natural gas in Northern Ohio this winter for fuel and heat have had a reasonably hard time of it. The winter has been what we would call one of the "snug" sort, the kind that makes one most of the time anxious to snuggle close to a good, hot stove. The gas has been so uncertain in quantity that a great many families in Northern Ohio have had to go back to the old, reliable hard coal. The supply of gas has been very uncertain, and the shortage is not confined entirely to the spells of extra cold weather. In one town that came under the writer's observation, the natural gas supply was so irregular that probably 50 per cent. of the consumers that depended on it for heat were obliged to put in coal in order to warm their houses. Two gas companies that installed steam heating plants in 1903 have abandoned the field as a very unprofitable investment. In fact, scarcely a town in Northern Ohio has not been invaded by natural gas at one time or another, and in almost every instance the artificial supply was shut down, the natural material being sent through the old mains. The larger towns that are still in the field and selling artificial gas are doing a good business and holding "their own" in good shape.

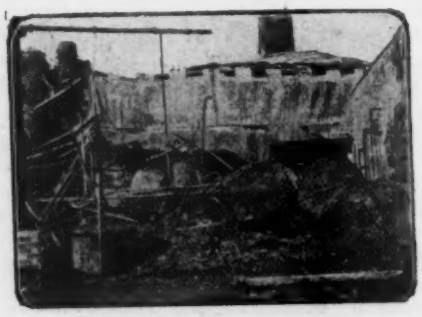
The Tar Works at "Ordnance Wharf," London.

The *Gas World*, in its issue for the 7th inst., prints the following article descriptive of the tar (etc.) works of the South Metropolitan Gas Company, London, England, which mention was originally prepared by Mr. S. S. Field, for the South Metropolitan *Copartnership Journal*:

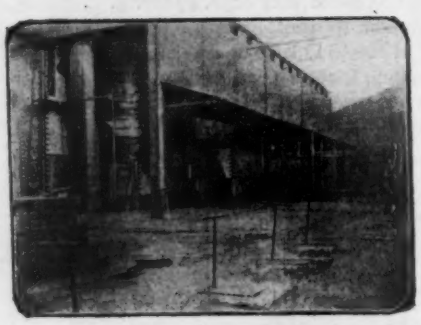
We reproduce the following chatty, interesting article by Mr. S. S Field, and we are indebted to the courtesy of the editor of our youngest gas contemporary for the loan of the blocks by which the article is illustrated:

Noah was told to pitch the ark within and without with pitch. Pitch being the residuum of the distillation of tar, the art of tar distilling was evidently known before the Flood, but I suspect not quite as carried on at Ordnance Wharf, although we be classed as ancient in some of our methods when compared with the synthetical manufacture of products by our German cousins. Most readers are aware that since July, 1903, the Company has been working up its own tar at Ordnance Wharf. The tar is received from East Greenwich station through a 9-inch cast iron pipe, and from all the other stations in tank barges. The tar as received is pumped into tanks holding over 60,000 gallons each, where it is steamed and allowed to settle; the supernatant ammoniacal water is then run off and sent to East Greenwich station, to be used in the manufacture of sulphate of ammonia. The tar is then run into an underground well of 1,300,000 gallons capacity, where it is stored.

Ordnance Wharf.



Trouble—Feb., 1901.



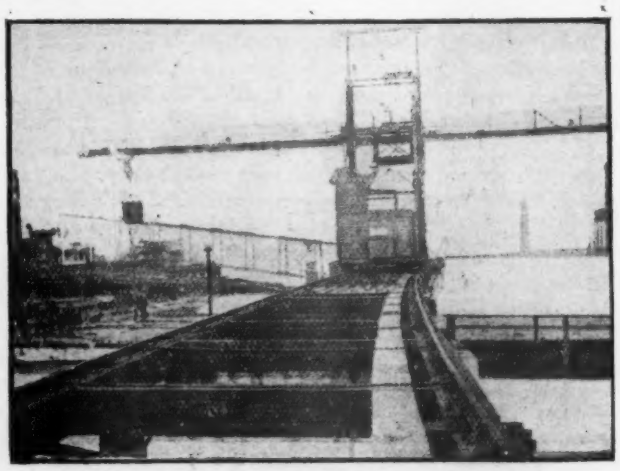
Straight—Oct., 1901.

From May to September we receive less than 1,000,000 gallons of tar per month, but from October to April we receive over 1,000,000 gallons per month; and as our two stills work up just about 1,000,000 gallons per month, the excess quantity received in the winter months is stored in a large well, to be worked in the summer months, so that practically we work up the same quantity of tar all the year round. By this means the number of men employed is fairly constant, and, such be-

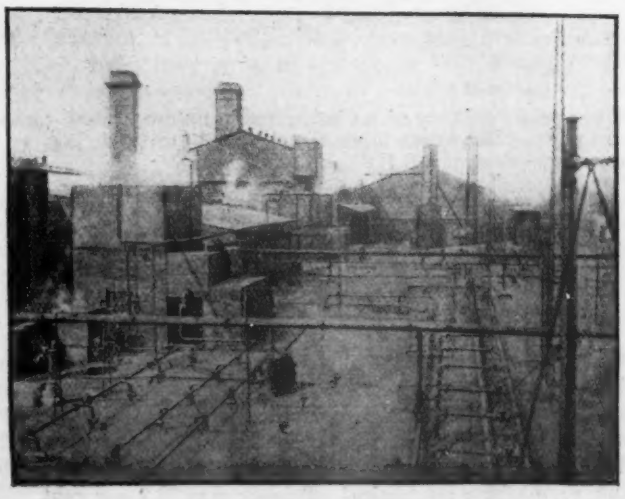
ing the case, is conducive to economical working. One of our stills has a capacity of 24,000 gallons per day, and the other 14,000 gallons per day. Both are what are termed "continuous"—that is to say, we are continuously pumping into them and products are continuously being distilled from them. Before these stills came into vogue tar was distilled in what are called pot stills, having a working capacity of from 2,500 to 3,000 gallons per day. If we worked up tar by this method we should require a considerable number of these stills to enable us to get through the 10,000,000 gallons of tar which we receive per annum. Our largest still is a flat coil of wrought and cast iron piping having a total length of over half a mile. The inlet of the coil is 2½ inches in diameter, and it increases in size until at the outlet it is 4 inches in diameter; the reason for this is that the hotter the tar the more room it takes up. The coil is built over furnaces the flues of which are so arranged as to get the least heat at the inlet and the greatest at the outlet of the coil. For these stills it is necessary to use gaseous or liquid fuel. We have both in use.

Most distillers obtain their products by what is called fractional distillation—that is, you get the lightest products first and the heaviest last. We get ours by what we call fractional "condensation," *i. e.*, having heated the tar to the highest temperature required, the tar, on reaching the outlet of the coil, at once gives up all products in the form of vapor, and by means of condensation we get the heaviest products first and the lightest last. In these stills we use crude tar to condense the vapors. By so doing we save the cost of pumping water, and the tar which is used for condensing is heated to a temperature high enough to free it from all its water and most of the naphtha present. The hot tar from the condensers is pumped through the still (coil of pipe), and we get the crude products in the following order: Pitch, anthracene oil, creosote oil, and light oil. With the exception of pitch, all these products are run into underground store tanks to be further treated or refined.

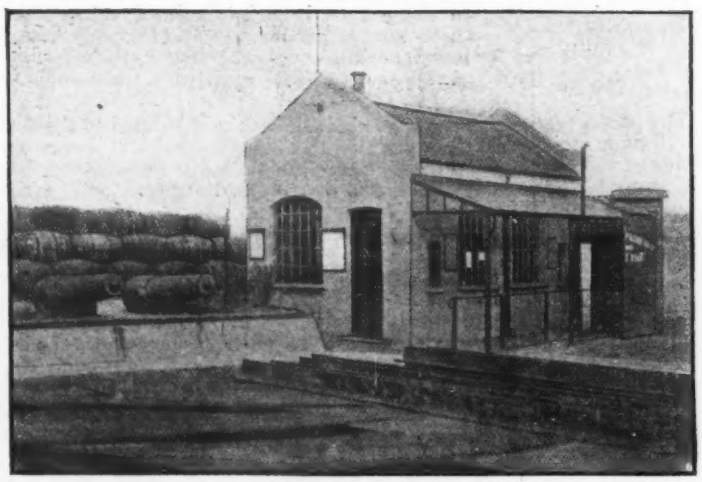
The pitch is run through steam-jacketed pipes into closed tanks, where it is allowed to cool down for several hours; it is then run into what we call pitch bays (these hold from 1,000 to 2,500 tons each), and when cold is ready for market. We can store in our bays over 10,000



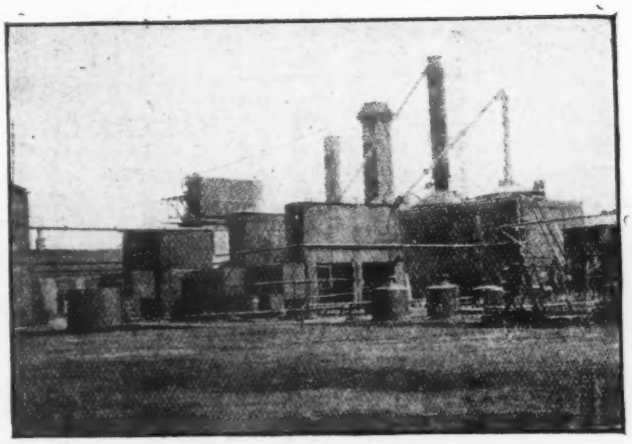
Tempoerley Transformer.



Pipe Connections to Underground Storage Tanks.



Entrance.



Naphtha Plant.

tons of pitch, and our annual make is about 35,000 tons, being about 60 per cent. of the tar received.

At least 90 per cent. of our pitch is sent abroad, and most of it to the Continent. Quite 90 per cent. of all coal tar pitch made in this country is used in the manufacture of patent fuel, which consists of about 8 per cent. of good pitch mixed with small coal. Other uses for pitch are for making asphalt, felt for roofing, insulating land and marine electric cables, making varnishes and waterproofing bridges, and a small quantity is used by barge builders and coffin makers.

We have a very up-to-date plant for loading vessels with pitch alongside this wharf; it is what is called a Temperley transporter. One part of it is called a travelling tower transporter, and the other a portable bridge transporter. The first portion takes the pitch from any part of the bays to the weighing machine at the bottom of the jetty, and the other takes the skip from the machine right into the vessel's hold, where the skip is self-tipped. With this machine we can load from 25 to 30 tons per hour.

The whole plant is is a clever and well-thought-out piece of work.

Anthracene and Oil.—Our make of anthracene is what is known in the trade as "A" quality, and is one of the best, if not *the* best in the world. Germany is the great user of anthracene, where it is made into alizarine dyes. At one time anthracene was worth over £250 per ton; but, owing to over-production, has for the last few years been almost unsalable. The oil from anthracene is used for grease making and in the Lucigen lamp, also for preserving timber.

Creosote and Oils.—From these we get carbolic and cresylic acids, which are used for disinfecting purposes. Carbolic acid is used for making picric acid, which is again used for making "lyddite," the explosive of which we heard so much of in the late war. From creosote is also obtained naphthaline, which is used for making colors, as a disinfectant, as a preserver of skins, etc., against the ravages of moths, also in the albo-carbon lamp, and, when made into nitro-naphthaline and mixed with nitrate of ammonia, is a powerful explosive. The oils are used for preserving timber and for making lampblack.

Light Oil.—From this we get carbolic and cresylic acids, solvent naphtha (used for dissolving indiarubber), and a naphtha which is used in the manufacture of anti-fouling paints for ship's bottoms.

Crude Naphtha.—From this we get benzol, toluol, solvent naphtha and pyridine. Benzol is used to make aniline dyes and for carburetting gas. Toluol is used for making colors and saccharine. Pyridine is used for denaturing spirit (mixing with alcohol so that it is impossible to drink it).

The photograph of the naphtha plant shows the stills used in the first distillation of naphtha and naphthaline. As manager at Ordnance Wharf I have worked up the tar made by the South Metropolitan Gas Company for about 20 years, and in that period have seen great variation in the price of products:

Pitch has been low as	7s.	6d.	per	ton	and as high as		60s.
Carbolic acid	"	"	1s.	6d.	"	gal.	"	"	5s.
Benzol	"	"		9d.	"	"	"	"	10s.
Anthracene	"	"	£4		"	ton	"	"	£100.

I have known the time when we had to store tar in our pitch bays, and I remember that we had a Norwegian vessel alongside the jetty and a missionary came down to talk to the sailors. He stayed late and thought he would take a short cut across the pitch bays. The one he chose was the one with tar in (they all looked alike); the result was he obtained a suit of black, cheap.

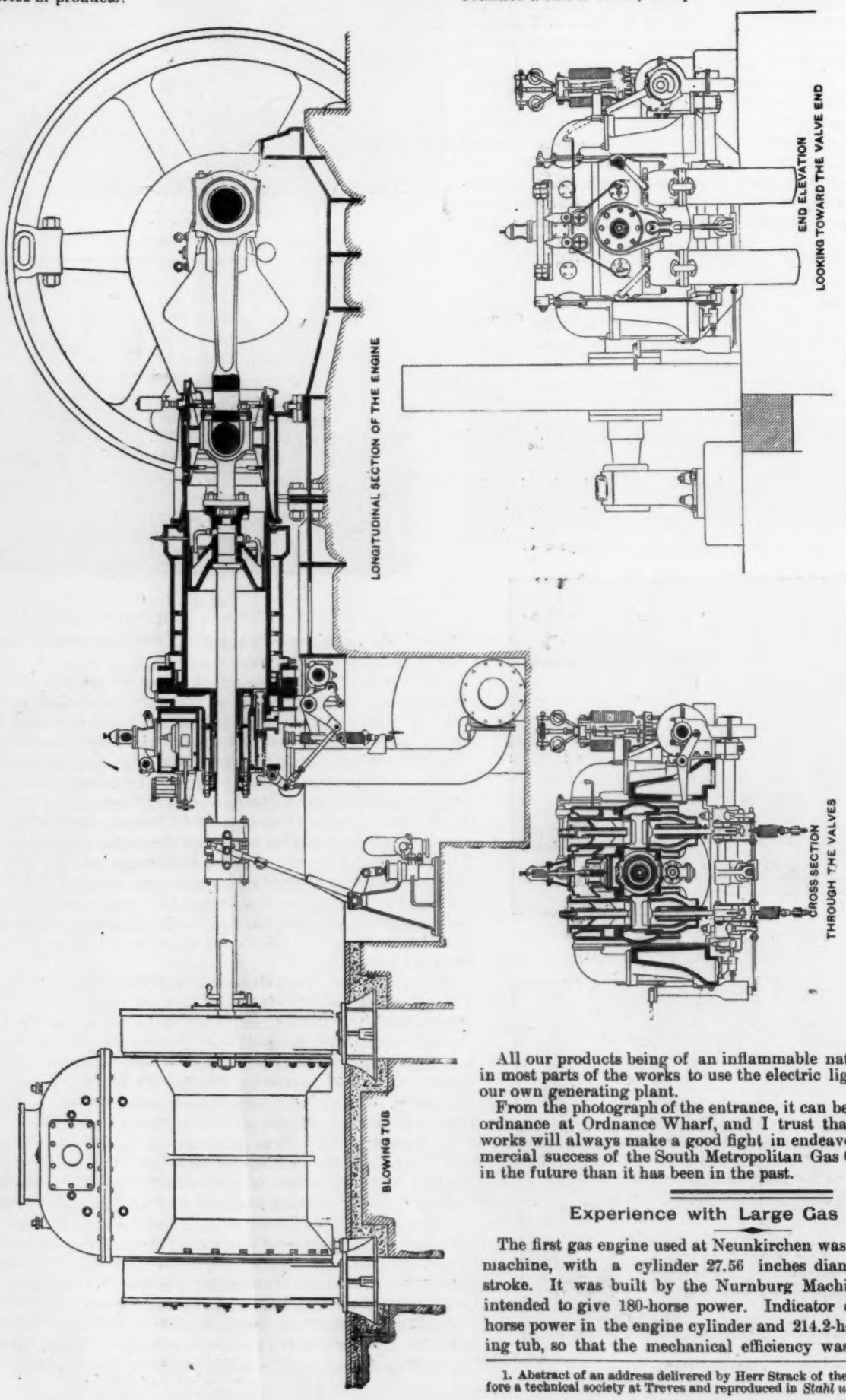


Fig. 1.—Sections and Elevations of the First Gas Engine Used at Neunkirchen, built by the Nurnburg Machine Company.

All our products being of an inflammable nature, we are compelled in most parts of the works to use the electric light; to do this we have our own generating plant.

From the photograph of the entrance, it can be seen that we still have ordnance at Ordnance Wharf, and I trust that all engaged at these works will always make a good fight in endeavoring to make the commercial success of the South Metropolitan Gas Company even greater in the future than it has been in the past.

Experience with Large Gas Engines.[1]

The first gas engine used at Neunkirchen was a single acting, 4-cycle machine, with a cylinder 27.56 inches diameter by 33.46 inches stroke. It was built by the Nurnburg Machine Company, and was intended to give 180-horse power. Indicator diagrams showed 296.6-horse power in the engine cylinder and 214.2-horse power in the blowing tub, so that the mechanical efficiency was 72.2 per cent. Fig. 1

1. Abstract of an address delivered by Herr Strack of the Neunkirchen Steel Works before a technical society at Treves and reproduced in *Stahl und Eisen*.

shows sections and elevations of this machine. The cylinder head, which consists of three parts, is of especially interesting construction. The middle piece, which is bolted to the cylinder, is shown in Fig. 2.

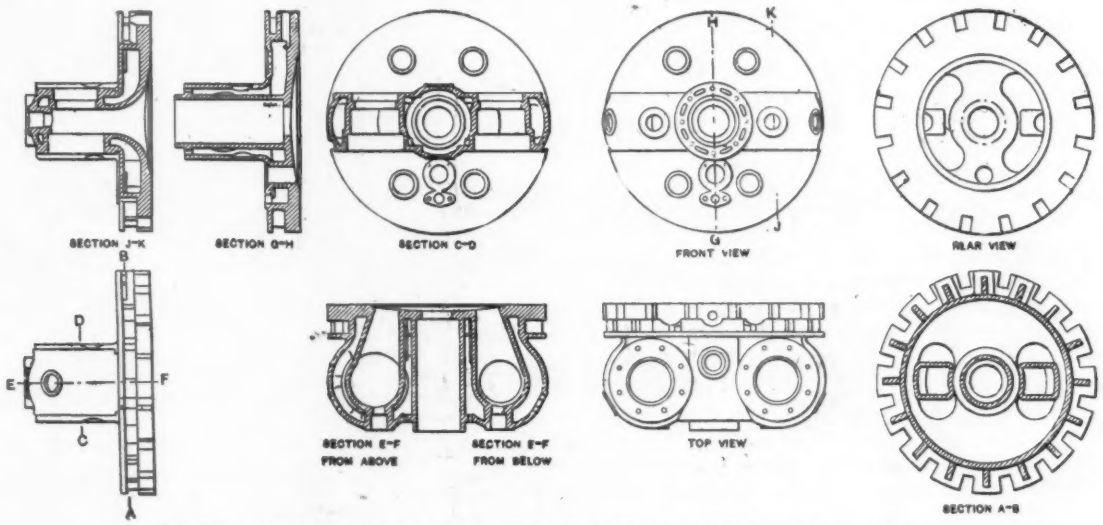


Fig. 2.—Detail of the Middle Part of Three-Plate Cylinder Head in the Gas Engine Shown in Fig. 1.

On this rests the top piece containing the gas valve and the two inlet valves. The third part consists of the two exhaust valve housings, bolted separately to the under side of the middle piece. Each inlet valve is situated vertically over an exhaust valve. By this construction of the head no casting is very complicated, and the upper part is not subject to any great heat.

One of the greatest troubles with cylinder heads is the liability to fracture due to unequal expansion of the inner and outer walls. There should therefore be as few ribs between them as possible to allow independent expansion and contraction. This condition is fulfilled in the upper part but not in the middle and lower parts, and in consequence a crack has appeared on the under side of the openings leading to the valves. A similar cause has had a similar effect in the back of the cylinder lining, where there are two cracks, which, however, do not extend beyond the width of the collar used to form a joint with the cylinder. None of the fractures have proved serious enough to necessitate replacing the defective castings.

The engine was at first governed by the governor acting on a cam which varied the lift of the gas valve. It was, therefore, a qualitative regulation, as the amount of air admitted remained unchanged while the gas was decreased. This arrangement has the disadvantage that, with a light load and little compression, the mixture is apt to become so weak that an explosion does not take place. In the present case there was no danger from this source, as the power being used for blast purposes the load was always sufficient to insure ignition. Later automatic speed regulation made its appearance and the governor was removed entirely. With the automatic system by the throttling action of the valve the gas is drawn in under a certain amount of vacuum. This throttling decreases with the speed of the engine, so that with the same valve opening more gas is taken in than when running faster, the mixture becomes richer and the engine soon attains a speed corresponding to its load.

At first several of the water cooled exhaust valves cracked, but since they have given little cause for complaint. When first installed the cooling water for piston and piston rod was supplied and carried away through wire wrapped hose. This soon went to pieces and was replaced by the jointed pipes, shown in the drawing.

The blowing tub and engine are on separate foundations, only connected by two bolts at the level of the axis of the machine, and the piston rod has no outside supports. In consequence of this construction the movement of the heavy blowing piston caused oscillation of the tub, and this in turn caused rapid wear on the piston rod in the stuffing box of the power cylinder. The rod has now been renewed, having worn in 3 years from 6.69 to 6.25 inches.

It will be seen that this engine was by no means perfect, but after its numerous defects had been remedied it became a reliable machine. A tandem engine working on the same system was put into the Volklingen works about the same time to drive an alternating current generator. This also caused much trouble at first, but is now giving satisfaction.

Premature ignition has become a thing of the past since certain and easy means for keeping the cylinder head free from dirt has been provided, and the speed regulation is such that no difficulty is experienced in working in parallel with another installation.

In order to show the progress made in building 4-cycle engines, a 1,000-horse power, double acting machine of that type, recently ordered for use with blast furnace gas, is described. As it has not yet been delivered, however, the description is solely from drawings and specifications. The engine is of the 2-cylinder, tandem type, the cylinders being 31.89 inches in diameter, the stroke 39.37 inches and the speed 110 revolutions per minute. On a full load the mechanical efficiency is to be 84 per cent., and the consumption of gas, which is to have a minimum heating value of 450 B.T.U.'s, is to be not more than 225 B.T.U 's per indicated horse power hour. The cooling water must not exceed 8 gallons per indicated horse power hour, with an initial temperature of 59° F.

The general arrangement of this engine is as follows: The bed, which is supported by the foundation throughout its entire length, carries the cross head guides and the two crank shaft bearings. It is provided with a flange for bolting on the cylinder, and the latter is bored in one operation with the cross head guides, thus insuring their relative accuracy. Similar flanged connections are used for joining both cylinders to the middle piece and the rear cylinder to the rear guide. The stuffing boxes are so arranged that a certain amount of vertical movement of the piston rod can take place without injuring the packing. The valve housings are bolted on top of and underneath the cylinders. Water cooling arrangements are provided for pistons, cylinders, cylinder heads, exhaust valves and housings of the latter, and provision is made for easily cleaning all water spaces. As may be seen from Fig. 3, there are 6 valves on each cylinder—namely a double seated gas valve, an inlet valve and an exhaust valve, both single seated, at each end.

The gas valve is of the self-closing type, arranged to close at an invariable point of the stroke, while the time of opening is controlled by the governor according to the load. Gas and air are mixed at the gas valve, so that the space between the latter and the inlet valve is filled with explosive mixture. The inlet valve is positive, opened by a rod and closed by a spring. The exhaust valve, being incorrectly drawn in Fig. 3, is shown separately in Fig. 4, from which may be seen that housing, seat and valve are all water cooled. Valve and seat may be removed together by taking out the bolts of one flange, thus avoiding long delay. This valve is also closed by a spring, an arrangement of which the German approves in this case, but condemns in that of the inlet valve.

The writer next describes engines of the Koerting 2-cycle type, with the working of which he is familiar by reason of their installation at Neunkirchen. The first, a 600-horse power engine, is shown by Fig. 5. The bed plate consists of a built up rectangular frame running the entire length. Both engine cylinder and blowing tub are supported along their horizontal center line, so that their expansion or contraction will not affect the piston rod. The rod is carried on spcial bearings in front of the cylinder, between that and the blowing tub and behind the latter. Air and gas pumps are situated outside the engine frame, are driven by a crank disk at the end of the main shaft and have annular valves. The pump crank leads the main crank 180°, and operates both

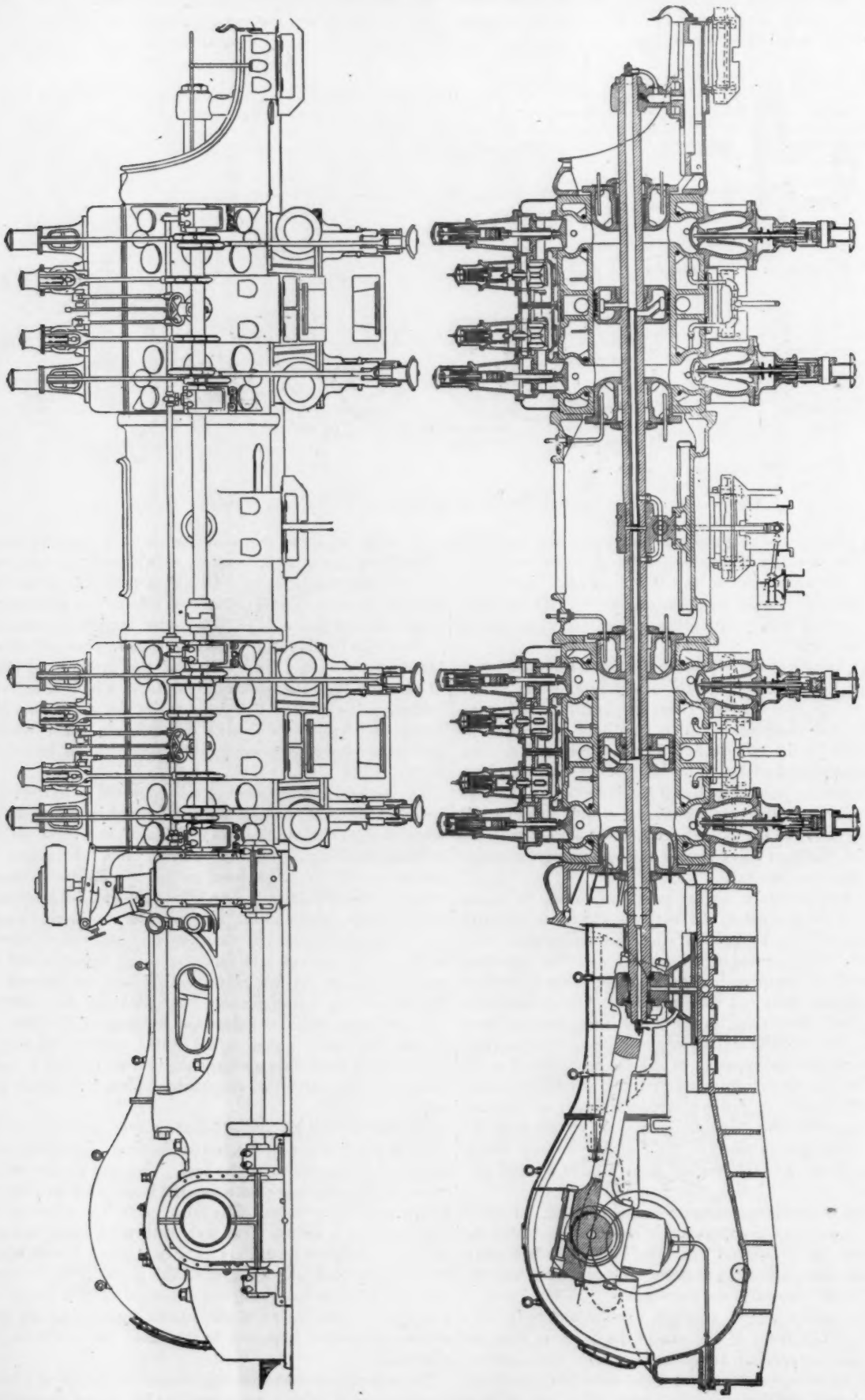


Fig. 3.—Elevation and Section of a 1,000-Horse Power Gas Engine Recently Ordered from the Nuruburg Machine Company, for Neunkirchen.

gas and air pumps on a single piston rod. The air pump cylinder is filled completely at each half revolution, so that the amount of air is constant. The gas pump, on the contrary, begins to deliver its contents to the engine at varying points dependent on the load. In spite of this fact the governing is, according to the engine builder, quantitative, not qualitative, which is explained as follows:

There are immediately over the inlet valve two concentric spaces, through the outer of which air enters, while through the inner gas is admitted, Mixing, therefore, does not take place till both are entering the cylinder. When the main crank is still about 40° from dead center the exhaust valve opens. At this time the pressure in the cylinder is 30 pounds or more per square inch, so that the products of combustion pass out with great rapidity, and when the crank is still 20° from the center the pressure is but slightly above that of the atmosphere. The inlet valve now opens but at first admits air only, as the gas pump has not yet begun to deliver gas. The air, entering with a pressure of about 9 pounds per square inch, will naturally make for the open exhaust valve, driving the remaining combustion products before it.

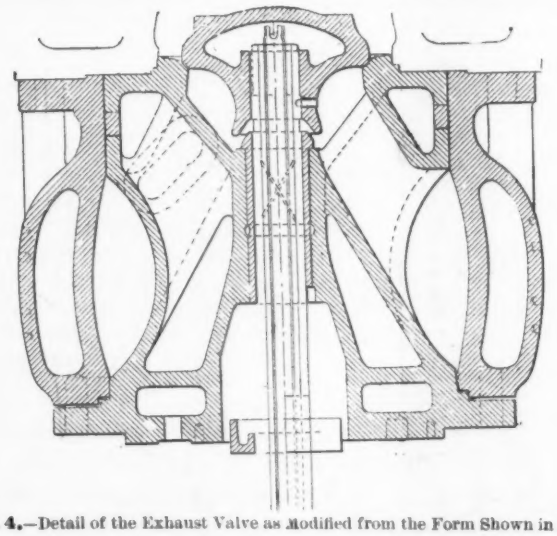


Fig. 4.—Detail of the Exhaust Valve as Modified from the Form Shown in Fig. 3.

Gas does not begin to enter until the back part of the cylinder is filled with air. When once begun, however, the proportions of gas and air remain constant, being the same as the relative area of their respective pumps. The mixture in turn drives the air toward the exhaust valve, which, however, closes when the crank is about 40° beyond the center, and shortly afterward the inlet valve closes also. According to Koerting, there is now in the cylinder a layer of air, and behind it a layer of explosive mixture, containing an invariable percentage of gas. When the load is heavy the gas pump begins to work earlier, and the layer of air is comparatively thin, but becomes thicker as the load decreases. The cylinder head is designed to assist this action. It has been frequently objected that this formation of layers is impossible, owing to the property of diffusion possessed by all gases, but it must not be forgotten that for diffusion to take place more time is necessary than is available under the circumstances.

The exhaust and inlet valves being closed the content of the cylinder is compressed by the piston. About 18° before the center is reached ignition occurs, followed by simultaneous compression and combustion until the end of the stroke. Very shortly after the center is passed combustion is complete and the expansion takes place. At the end of the expansion stroke the exhaust again opens and tne series of operations begins anew. The same thing takes place at the other end of the cylinder.

In the first engine at Neunkirchen the inlet valve was opened by a cam on the valve operating shaft, and closed by a strong spiral spring which caused much trouble by breaking and sticking. The piston in power cylinder was also a source of great annoyance. Owing probably to too great compression the wear on the rings was very great, and fractures occurred frequently. It was also very difficult to keep the piston water tight, with the result that it became hot in spots and caused premature ignition, the reason for which it took a long time to determine. Cylinder lining and mantle were cast in one piece, and the former being subject to greater heat than the latter, and being rigidly held at the ends, expanded in the middle, where, on account of the exhaust openings, the resistance was least. This seemed very serious on account of the danger of a broken piston ring catching in one of the openings, but when this actually took place the ring was sheared off without causing further danger. Pieces of piston ring have been found in the cylinder which had been thrown to and fro till they were rounded like pebbles. Other parts of the engine have run satisfactorily. The Koerting engine was indicated in the power cylinder, blowing tub, gas and air pumps simultaneously.

From the results shown in the accompanying table it may be seen that the pumps consumed in the least favorable test 17 per cent. of the indicated work in the engine cylinder and in the most favorable 11.5 per cent. In 4-cycle engines the power consumed by the pumps is replaced by the negative work, shown on indicator cards, between the suction and exhaust lines, which amount is about 8 per cent. of the positive work. The diagrams show, however, that in the engine under discussion the work of the pumps is unecessarily great. The same could be much reduced by shortening the long pipe through which air is drawn from outside the building and enlarging the passages through which the compressed air and gas pass to the cylinder. The pumps of 2-cycle engines are not therefore so bad as they are sometimes represented.

A minor evil of engines of this type is the violent and noisy exhaust, due to the fact that the cylinder must be cleared while the crank is revolving 80°, whereas in the 4-cycle engine a half revolution is taken up for the purpose.

The experience gained with this engine was avaliable when the second one of the same type, an 800-horse power blast furnace blowing engine, was installed at Neunkirchen. Some of the principal changes were in gas and air pumps, the relative positions of which were reversed, the former being placed nearest the shaft. The long air suction line was replaced by short tubes connected to a wide and high air passage immediately beneath. In the older engine both pumps are operated by means of annular valves, and the gas pump is further provided with a rather complicated arrangement to enable gas to return from the pressure to the suction side when the load is light. The newer machine has an air pump provided with suction and discharge valves which act automatically. The gas pump is positively regulated on the suction side by a Rider slide valve, controlled by a governor, while the discharge valves are automatic. The passages for air and gas under pressure were also made larger. The cylinder and lining have been made separate, and the metal between the exhaust openings in the latter sawed through to allow for expansion. The suction valves of the blowing tub are operated by eccentrics on the main shaft, instead of on the side shaft. In the older engine the gears caused much trouble by working loose, owing to the constant shocks.

The arrangement in the first engine of inlet valves opened by a cam and closed by a spring having given so much trouble, the corresponding valves of the new engine were made to be both opened and closed by levers, with satisfactory results.

In Differdingen a rod mill and other rolls are driven by a duplex gas engine of tne Oechelhaeuser type. The cylinders are arranged side by side, and behind them in the same horizontal plane are the pumps. The latter deliver air from one side of their pistons, gas from the other, and are driven by a rearward extension of their piston rods. Both suction and discharge valves of the pumps are automatic. The speed is controlled by a governor acting on a by-pass, which allows gas to return from the pressure to the suction side. The valve mechanism of the engine itself consists of the well known two pistons, of which one controls the gas and one the air. The side shaft is used only for operating the igniter and the governor, so that the whole arrangement is the simplest possible. Of all the gas engines in Differdingen this one

Experiments with a 600-Horse Power Koerting Gas Blowing Engine.

Experiment Number.	Revs. per Min.	Engine Cylinder. Average Pressure. Pounds per Square Inch. Front.	Back.	Horse Power	Blowing Tub. Average Pressure Pounds per Sq. In. Front	Back	Power. Horse Power.	Per centage*	Air Pump. Average Pressure. Pounds per Square Inch. Front.	Back.	Power. Horse Power.	Per-centage.*	Gas Pump. Avreage Pressure. Pounds per. Sq. Inch. Front.	Back.	Power. Horse Power.	Per-centage.*	Total Power for Pumps. Horse Power.	Per-centage.*	No Load. Power. Horse Power.	Per-centage.*	Operating Valves and Delivering Blast. Percentage of Blowing Tub Work. Front.	Back.	Air Drawn in. Percentage of Piston Travel. Front.	Back.	Total Air Drawn in Cubic Feet.
VII-9..	80	86.5	79.6	910	8 2	8.6	647.3	71 1	6.7	7.3	65.	7.14	7.5	8.0	90.	9.89	155.	17.	108.	11.9	7.29	8.95	94.70	97.22	16,660
I-3.....	58	66.0	69.1	537	7.4	7.1	406.2	75.6	3.7	3.7	25.	4.65	4.5	4.2	37.	6.9	62.	11.5	69.	12.6	5.4	6.0	95.35	98.66	12,297
I-7.....	57	56.3	60.9	458	5.7	5.9	318.4	69.52	3.2	3.3	21.5	4.70	4.6	4.2	36.5	8.0	58.	12.7	81.6	17.8	8.95	9.25	97.0	97.57	12,053
I-9. ...	58	56.3	56.6	449	5.4	5.7	311.5	69.37	3.2	4.0	21.	4.67	4.7	4.5	39.5	8.8	60.5	13.4	77.	17.14	8.3	....	96.64	97.57	12,222
VIII-11	82	83.1	78.5	908	8.1	8.7	665.0	73.2	6.7	7.6	68.5	7.54	6.5	6.9	81.	8.92	149.5	16.46	93.5	10.3	9.47	8.9	95.00	97.57	17,138
VII-5..	78	85.6	85.3	914	8.1	8.8	633.5	69.31	6.7	7.4	64.	7.0	7.4	7.8	85.5	9.35	149.5	16.35	131.	14.35	8.0	8.33	95.6	97.2	16,294
Average of I-3, I-7, I-9—																									
57.6	71.7	60.9	461	6.2	6.3	345.4	71.49	3.3	3.3	22.5	4.67	4.6	4.3	37.7	7.9	60.2	12.53	75.9	15.85	7.55	7.63	96.33	97.93	12,184
Average of VII-9, VII-11, VII-5—																									
.80	85.1	81.2	911	8.1	8.7	648.6	71.2	6.7	7.4	65.8	7.23	7.1	7.6	86.6	9.39	151.3	16.6	110.8	12.18	8.25	8.73	95.1	97.33	16,695

* Percentage of total power produced.

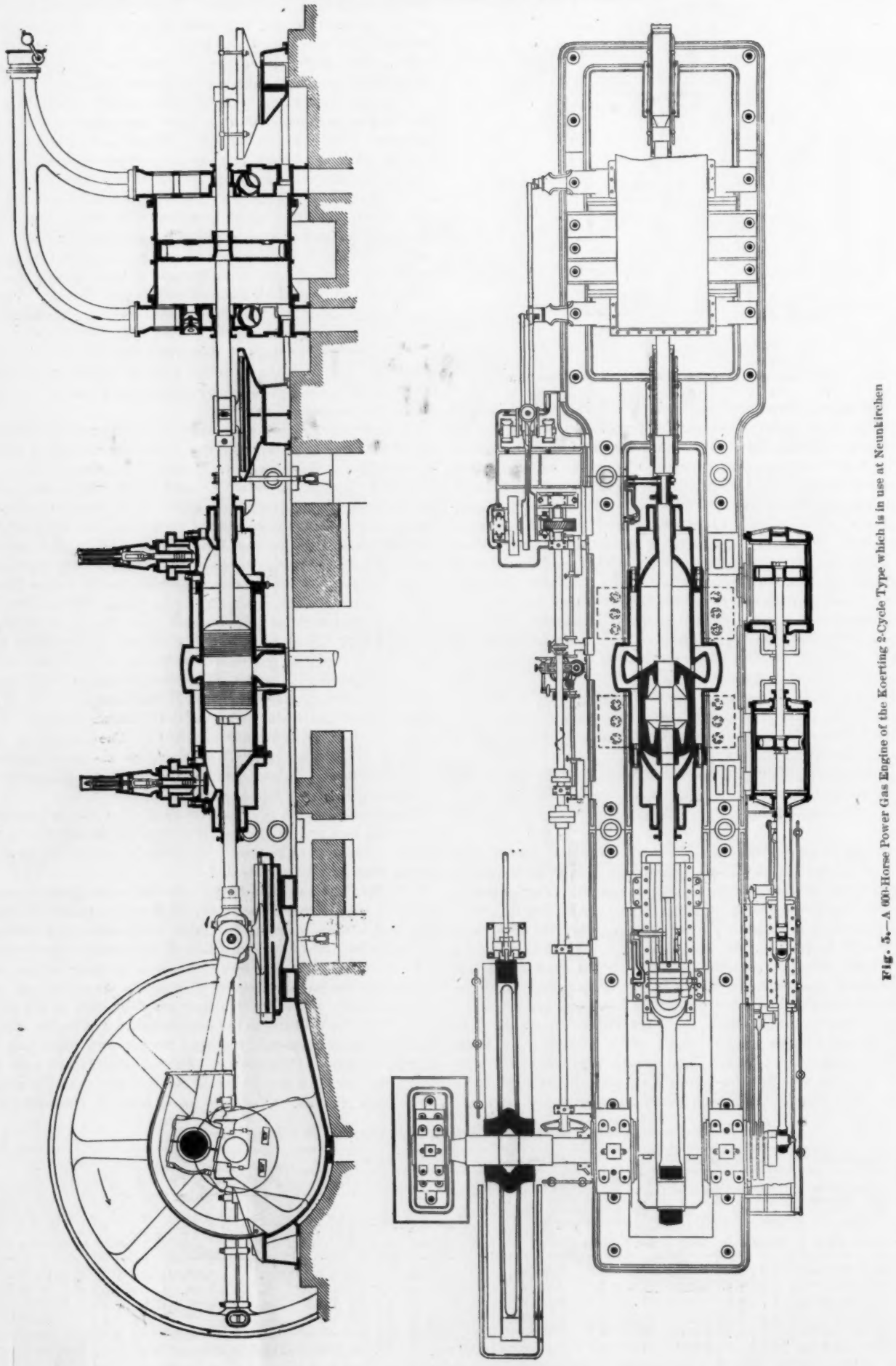


Fig. 5.—A 600-Horse Power Gas Engine of the Koerting 2-Cycle Type which is in use at Neunkirchen

costa the least for repairs. As the cylinders are open at one end the lubrication can be closely watched, and less oil is used than is the case with double acting engines.

The German writer thinks that the battle for supremacy in large gas engines is between the double acting 4-cycle engines, the Koerting and the Oechelhaeuser types. Further, that victory will not necessarily rest with the engine using the least gas, but with that which offers the greatest security in operation. He is also of the opinion that the gas engine is not suitable for rolling mills, as it needs too many repairs, too much room and too much attention. Blowing engines will be driven direct, and other gas engines will be used for generating electricity, which in turn will drive rolling trains, cranes, etc.

The Use and Abuse of Wire Rope.

[A paper read by MR. L. C. MOORE, before the Mich. Section, Engineers' Society, Western Pennsylvania.]

It is thought best to confine this paper to a discussion of cast steel and the higher grades of wire rope, and it is also considered that it may prove more interesting if a short explanation of the methods of preparing wire for these grades of rope is prefixed.

Nearly 90 per cent. of all the stock of steel for rope wire is imported, in the form of either billets, wire rods, or partially manufactured wire. Steel rods for rope are always larger than No. 6 B.W.G. (0.203 inches), owing to the comparative higher tariff on smaller sizes.

The analysis of wire rope rods for cast steel rope is:

	Carbon.	Manganese.	Silicon.	Phos. not Above.	Sulphur not Above.
For extra strong.	47 to .58	.20 to .30	trace.	.035	.035
For plow steel...	65 to .70	.35 to .50	trace.	.035	.035

The rods are cleaned, *i. e.*, the scale and rust, if any, removed by means of sulphuric acid diluted with, say, 95 parts of water which is heated to a boiling point. The coils, weighing from 60 to 100 pounds, are immersed in the tubs on wood reels and the process of cleaning usually requires about 30 minutes. They are then removed by hooks or crane and thoroughly washed with water and kept wet until they are water coated. This term is more clearly understood by the following explanation: that the rods being entirely free from scale and rust immediately commence to oxidize again and if kept wet for some time a coating forms on the surface that is afterwards utilized in drawing or reducing to the diameters required. After they have been thus prepared they are thoroughly coated with a solution of lime or whitewash, and, of course, further oxidation is at once prevented, provided, however, they are in the meantime carefully dried. The rods must now be baked, as during the cleaning process they have taken up a certain percentage of an element from the sulphuric acid and they cannot be drawn until all of this has been eliminated, and this can only be done by baking, and requires a heat of about 400° F. and for a period of not less than 10 hours. Elaborate experiments have so far not developed any superior or quicker process than that above mentioned.

The rods being ready for drawing or reducing in diameter we will, in referring to such reduction, use decimal parts of an inch as being more comprehensive than numbers, as applied to the wire gauge. As before stated, they are about 0.200 inch in diameter and are first drawn to 0.150 inch — 0.155 inch. This is accomplished in two reductions or drafts, one wire drawer operating two wire blocks, the first draft from 0.200 inch to 0.165 inch — 0.170 inch; the second draft reducing to 0.150 inch — 0.155 inch.

In this connection the peculiar features of the wire drawing plate are considered first. They are sometimes made of what is commonly known as white cast iron, but the plate principally used is made of a special steel, and for the larger sizes perforated with 18 conical shaped holes which, owing to the peculiar nature of the metal, can be opened or closed at will by the operator, who uses a hammer and a perfectly round highly tempered and polished steel punch, carefully ground to just the right taper. This requires not only skill but a knowledge of the peculiarities of the stock to be drawn; it being a fact that steel comparatively high in carbon and manganese cannot be successfully drawn with the same tools as low or .08 carbon stock.

Referring again to the nature of the steel from which wire drawing plates are made, it is very low in carbon and will not take any temper. It is, therefore, soft enough to permit cutting readily with an ordinary cold chisel, and, as before stated, the holes can be closed or opened at will without heating the plate. Yet, notwithstanding the above, steel wire rods 0.60 carbon and upwards, coils weighing even 100 pounds and more than 1,000 feet long, can be drawn through a properly prepared hole in a drawing plate, reducing the diameter of the rod from 0.200 inch to 0.170 inch without enlarging the hole more than 0.003 inch, and this is common practice in all mills. It will be noted that this reduction necessarily hardens the stock to some extent, but does not injure it because the elastic limit has not been passed, and without any additional treatment the coil will undergo another reduction from 0.170 inch to 0.150 inch or 0.155 inch; and if the drawing plate has been properly prepared this takes place without enlarging the diameter of the hole more than 0.005 inch.

By this time the steel has been hardened to such an extent that further reductions cannot be made without injury until the stock has been annealed or tempered, also recleaned, coated and baked. If the former, this must be done with what is called a muffler, this being a furnace so constructed that coke, oil or gas can be used as fuel; soft coal being too high in sulphur for the purpose. The furnace must also be so constructed that no iron in the furnace lower in carbon than the stock itself comes in contact with the wire, because if so the tendency will be to decarbonize and thus injure the latter.

It follows, therefore, that a better grade of rope wire can be made by not using this form of annealing, but rather the continous or tempering process, by which means no dangerous flames or fumes of any description can come in contact with the wire, thus preserving all the elements that are advantageous in making the best rope wire. Another feature of this latter process is: The wire being drawn into the heating tubes of the furnace from the coil, the heat of the furnace being kept at exactly the proper temperature, with careful regulation and a good pyrometer, there is no danger of injuring the wire by oxidization, because as the wire is drawn out of this furnace it is not exposed to the normal atmospheric conditions outside until cool enough so that any such contact would have no effect whatever on the stock.

After reducing the rods from 0.200 inch to 0.155 inch, tempering or annealing by the continous process, again cleaning, coating and baking the wire with even more care than the first time, the stock is now ready for a further reduction. All this is accomplished in exactly the same manner as the former, the tools being smaller in size and diameter only. Also after the first drawing and continuous annealing process it is a fact that the quality of the stock has been improved, and this being the case the wire can be reduced 4 or even 5 drafts without annealing or injury; not such a severe reduction in parts of an inch, but just as much or more proportionately to its diminished area as before. Rope wire of 0.155 inch diameter after being properly treated can be reduced to 0.097 inch, after which, if further reductions are required, it should be treated in precisely the same manner as already described.

All of the various stages of reduction from 0.200 inch to 0.097 inch, referred to above, have also served another purpose: that of locating flaws or points low in tensile strength. Therefore, by the time the wire reaches the inspecting and testing departments nearly, if not quite all, the inferior stock has been discovered, rejected as rope wire and to be used for some such purpose as finer or market wire.

The best quality of cast steel rope of any prescribed strength is that in which the wires of same are the most uniform in the bending and tensile strength tests. Neither torsion nor elongation as tests are of any importance in determing the quality of rope wire in the testing department. If the manufacturer, in making up a stock reel of say $\frac{5}{8}$ inch diameter 6 × 19 cast steel rope, permits a variation of more than 5 per cent. in tensile strength and the same in bends, then this rope will not in all cases show good service, but if both tests are confined to say 2 per cent. variation in each direction, the quality of the stock reel will be perceptibly improved. All practical minds will agree that if wire is used in rope varying from 160 to180,000 pounds per square inch in tensile strength, there will be a difference in resistance to bends. Therefore, it follows that it is not always safe to depend on determining the probable life of a partly worn rope by counting the number of exposed broken wires to the foot or yard. Neither does it follow that because, say, one-half of all the wires exposed are broken that it is time to abandon its use or procure a new rope, because it may be that the factor of safety is high and we must admit that with one-half of all the wires broken the rope is more pliable than when new; and to sum up the fact of one-half the wires being broken usually proves that either a smaller diameter or more pliable rope should have been purchased in the first place.

There is an impression that sometimes a rope is made with a bad spot in it running say several hundred feet long. This is utterly impossible, and the reason is as follows: Take, for instance, a piece of $\frac{5}{8}$-inch diameter 6 by 19 cast steel rope, which would be a total of 114 wires in all. Now the size of wire used for this rope weighs 23 pounds to the mile, and as before stated, drawing the wire several different times has developed the majority of bad spots, and even if not, it is impossible in a mile or more of rope for these spots to come near enough together to cause any damage, and also because it is a fact, as has been demonstrated, that a test specimen with more than half of the exposed wires broken has shown a tensile strength of 90 per cent. of the original.

It is undoubtedly a fact that more mistakes are made in buying a rope too large in diameter than too small for the service, and also in selecting one made of 7 wires to the strand instead of 16 or 19 wires.

Referring to 6 strands of 12 wires each, this style of rope should never be used except for standing or guy rope. Neither is there any decided advantage in the use of what is known as "Lang Lay," or so-called patented ropes, except from the possible fact that the manufacturers

thereof are in some instances sharp enough to use a plow-steel grade of stock in so-called cast steel rope and thus make a temporary record; and there is no known trade mark of rope that has proven itself superior to any other, and in fact the consumer must depend entirely on the honesty of the manufacturer from whom he buys his rope. He may in installing a new plant purchase a rope from "A," and when same is worn out buy another from "B." Now it may be possible that the second rope does not give as good service as the first one, therefore, he makes his third purchase from "A" again; and this rope may give more unsatisfactory service than the first rope from "A." Usually this can be explained by the fact that the plant, that is, the sheave wheels, have not been kept in as good order as when first installed, or possibly the tonnage has been increased. Still the consumer of wire rope is not always at fault. It more frequently happens that the dealer or agent who sells the rope unintentionally makes a mistake in case the customer is not posted and recommends a style not exactly suited for the purpose. This possibility is gradually decreasing, owing no doubt to the fact that profits on sales are gradually being reduced, and there are not so many dealers in or agents for wire rope as formerly.

As to the matter of claims for defective rope the manufacturer in making a stock reel usually keeps a record of same and at any length of time afterwards it is possible to ascertain to whom each and every piece of this rope was sold. Now if this reel originally contained 20,000 feet and was cut up and sold to say 11 different customers, 10 of whom keep quiet and the 11th customer complains, it is hardly possible for him to prove his claim.

Too much cannot be said regarding the care of wire rope. It requires lubrication just the same as high speed journals. Of course, conditions usually prevent any such treatment, but to insure the best results the rope, if made to order, should be thoroughly lubricated when the strands are being laid up into a rope; and if so treated and afterwards kept well saturated on the outside with any kind of cheap lubricant that is free from acids, good results are bound to follow. The same diligence should be exercised in looking after all sheave wheels. They should be balanced, or as nearly so as is possible, bored true with deep, wide flanges and the grooves kept lined with Russia hemp or other fibrous material. It is not good practice to run wire rope in chilled iron grooves, or even cast iron grooves, but if iron must be used, either a low steel or wrought iron lining should be specified for the grooves.

On Batteries with Reversible Boosters.

By Mr. C. Turnbull.

Some time ago I found it necessary to go into the question of having a battery and automatic reversible booster for use on the traction load at Tynemouth. The result of the investigation was the birth of the Lancashire Automatic Reversible Booster, which was brought out under the patents of Mr. McLeod and myself. This is now in considerable use, being made by the Lancashire Dynamo and Motor Company, of Manchester. In putting the machine into the various stations a number of points have come up in connection with the batteries, and I wish to deal with them, in hopes that the paper may be of use to such engineers as are putting down batteries for use under similar conditions.

Price for Traction Current.—The method by which the price for traction current is fixed is one of mystery. Sometimes I think that the lowness of the rate obtained for this kind of supply is partly to be accounted for by the fact that we sell in small units. Certainly the reduction from 2d to 1d. per unit looks a good deal less than the reduction of a year's revenue from, say, £4,000 to £2,000. At any rate, however the price is fixed, it commonly happens that, when a station engineer takes over the management of a station, he finds the glorious tramway load, from which so much is expected, resolves itself into a small output at a remarkably small price, and the problem of making it pay occupies his thoughts for many years to come. I make these remarks here, as in addition to the Greenock case, other instances are coming to light in which the trams are claiming to be supplied at the same rates, or lower, as are in force for ordinary motor load, although it is common knowledge that tram load is of an entirely different description from motor load, and should be dealt with on its own basis. The practice of debiting all stand-by plant which can be used for both lighting and traction, to lighting only, is also not to be commended.

Load Factor,—The large published load factors for traction supply in combined lighting and traction stations are frequently made use of when a low rate for traction is asked. Certainly 40 per cent. load factor (for I think a figure as high as this has been given) looks a lot better than the 10 per cent. for lighting. Actually, these large load factors are explained by the fact that the traction load is taken as that load which is on at the moment when the highest total combined load is on the station. Seeing that the highest combined load is usually on the station in the winter months, at a time when the traction load is often lower than its normal maximum, this system frequently causes the traction to be credited with a load factor much greater than it actually earns. To take an extreme case—in a station just beginning the highest combined load might be in the summer holidays, when the trams were heavy and the lighting very low. This would give a low traction load factor and a lighting load factor of perhaps 1,000 per cent. In a few year's time, when the station had grown, the lighting load factor might have shrunk to ordinary dimensions, while the traction load factor might come out very high. I think there is a good deal to be said for taking the respective highest loads for calculating the respective load factors. In connection with this we must also remember that while an engine may be run at nearly full load all the time on motor load, on traction load one must always provide a very large reserve of power to meet the grossly fluctuating demands which traction involves, and this does not make for economy in generating the power.

Batteries.—It has now come to be recognized that the best way to deal with a very fluctuating traction load is to put in a battery and reversible booster, and I propose to deal with some of the aspects of this solution of the problem. The idea has gained currency that a booster should be designed to keep the load on the generator always at a steady value. The problem is stated thus, omitting losses in battery and booster for simplicity—the output is 2,000 units per day of 20 hours. Then a 100 kw. generator with a battery and booster will just do the trick. If the maximum load be 200 kw., then the battery should be able to give 100 kw. easily for a short time, so as to meet the peak with the aid of the generator.

In some cases where the output is fairly regular from day to day, and where the maximum demand keeps within limits, this solution of the problem is quite good, and a very efficient and good working plant is obtained by adding a battery and booster to the generator. In many cases, however, this solution is of no use at all. The output varies from day to day. Likewise a large part of the day is slack, with a heavy output during certain hours only. If in addition to this we have heavy and irregular peaks at all times, then it is evident we must solve the problem in quite a different manner. Take, for instance, a case where there is already installed a plant of 200 kw.; the output varies from 1,500 to 2,500 units per day of 20 hours, and the maximum demand is 400 kw. Then, if we put a battery in with an output of 200 kw. for a short time, its maximum power added to the generator's maximum will give the required maximum demanded for the feeders. But if we attempt to run the generator at constant full load all the time, it will give off 4,000 units per day, and this will provide a large surplus at all times for boiling up the battery. The difficulty can be met by putting the machine to do only half load, but in this case the combination does not give out the 400 kw. needed to meet the heavy peaks which come on at intervals. Taking everything into consideration, then, it will be found that constant load on the generators can only be got in cases where the load is similar every day, and keeps on fairly regular throughout the day, and where the size of the generator can be fixed so as to put out the proper amount of current every day at about full load. Of course, in many cases, a good deal can be done by varying the number of hours that the generator is run, so as to provide just the number of units required to meet the load and to keep the battery properly charged.

Properties of Booster.—For a general solution of the problem the booster should have very flexible properties. It should, indeed, fulfill the following requirements:

1. When required, it should work so as to keep the load on the generator approximately steady. This will be needed when the demand for current is approximately equal to the output of the generator. In this case, however, when a very heavy demand is made on the feeders both generator and battery plant should rise to meet it, so that the utmost power of the combination will be available. If this is not arranged, it will often be found that a heavy load will blow first one circuit and then the other, although the combined maximum power of the battery and generator would have sufficient to meet the demand had the booster been arranged to allow the generator output to increase along with the battery's output.

2. It should be possible to vary the apportionment of the load between the battery and the generator. In a slack time the battery should do very little. Also, if the traction peak should correspond with the lighting peak, then it may be desirable to let the battery take an extra load to relieve the boilers for the time being.

3. On a slack day with occasional peaks the battery and booster com-

bination should be arranged to respond to the peaks only, and otherwise do practically nothing, so as not to overcharge the battery. Sometimes the booster may be cut out altogether, and the battery may then with advantage be used to float on the line to meet any occasional rush of current.

4. For periods of very light load, the booster and battery should be arranged to go on to the bus bars without any generator. In this case the booster should be arranged to compound up to counteract the drop of volts in the battery.

I might point out that a booster worked by the feeder currents only will not fulfill these requirements, as such a combination will tend to take the load off the generator when the battery is fully charged, while it will be sluggish and unresponsive when the battery is down at all in volts.

(To be Continued.)

The Safety of Electric Plants.

An editoral writer in *Electricity*, discussing the topic named in the heading, remarks: By some peculiar means of reasoning the tradition gained ground that electricity is a dangerous thing to meddle with, and the public satisfied for a time, as many are to-day, with the truth of this proposition, gazed with apprehension upon the rapid developments taking place in this sphere of activity. The electrician was and is regarded as a wizard, with a certain mysterious power of control over elusive forces, and this idea, perhaps. aided by the statements and sensational experiments of charlatans, has led to a belief, more firmly founded in the old than in the new generation, that electricity only represents shocks, burns, death and fire. The exact manner in which it may be used for electric lighting, for the operation of motors, or the running of electric car systems, has not as yet found its way into the layman's mind. Neither an abstract nor a concrete idea exists there in this respect. That which happens is unfortunately accepted as it stands and an active interest is only manifested when, to use a popular expression, the car or lights cease to operate because "a fuse blows." It is hard for the great mass of bread winners to realize that their personal safety is greater in a building lit by electricity than one lit by gas; that an electric car is by far a safer, healthier, and better controlled vehicle than one operated by steam or any other fluid. And finally, aside from other considerations, the risks from fire belong to such a category, that the insurance people believe that a building wired with up-to-date methods is the best risk on their books. This, of course, leads us to a consideration of the electric plant as a whole. What degree of safety can be guaranteed in connection with it? What part of such an equipment can be regarded as the most susceptible to the influence of destructive changes? The natural and logical answer to the last would be the boiler, and to the first a correct answer would be framed in these words:

The degree of safety that can be guaranteed in connection with an electric plant consisting of boiler, engine, dynamo and wiring is largely dependent upon the care of the boiler and engine. It rarely happens that well installed wiring, "iron conduit" as it is called, gives or can give any trouble. The risks of fire here are at their lowest possible figures. The dynamo is similarly not susceptible to changes unless it is heavily overloaded or neglected as regards oiling, etc. A well made engine represents more risks in this respect, although in the hands of a careful man they also are reduced to a minimum. What is left and is acknowledged as the greatest source of danger is the boiler. The boiler inspecting and testing commission, to a large extent, have this responsibility on their hands, yet the engineer must see that the boiler is kept clean and the safety valve is always operative at the set pressure. These facts remove all doubt as to the safety of electric plants, particularly the electrical part, and show that a well paid, well trained and intelligent engineer is the only one fit to discharge the duties required of him. In such hands the safety of electric plants is assured and it would be almost epigrammatic to state that "the safeness of electric plants is the safeness of those in charge of them."

At the annual meeting of the shareholders in the Laclede Gas Light Company, of St. Louis, Mo., the officers chosen were: C. W. Wetmore, E. M. Buckley, George R. Sheldon, John I. Beggs, C. H. Huttig, W. F. Nolkes, Breckenridge Jones, Julius S. Walsh and E. G. Cowdery; President, C. W. Wetmore; Secretary, C. L. Holman; Treasurer, C. A. Tucker; Vice-President and General Manager, E. G. Cowdery.

SPECIAL ENGLISH CORRESPONDENCE.

Communicated by Norton H. Humphrys.

Salisbury, England, Jan. 10th, 1905.

The Peak of the Load.—State of Trade.—Some Casualties.—Naphthaline.—Earls' Court Exhibition.

The difficulties incident upon meeting the demand for gas during the week before Christmas, which are always considerable when the festival falls on a Sunday or Monday, leaving a clear week to be provided for, were accentuated this year by the prevalence of a heavy fog, with the result that some phenomenal outputs of gas are recorded. The Gas Light and Coke Company, for example, sent out over 120 thousand millions on the 22d inst., as compared with 95 for the corresponding day in 1903. The South Metropolitan Gas Company show a similar increase, the respective figures being 63 and 50. The principal towns also show 15 to 20 per cent. increases. The fact that such large consumptions were dealt with, and yet that the full pressure was maintained, speaks well for the distribution plant. As it was, it was left for the purveyors of electric light to illustrate the difficulties brought about by variable consumption. But as regards gas consumption, it is evident that the introduction of gas fires and incandescent burners has inaugurated a different condition of things. The older Acts of Parliament prescribe a pressure of 6-tenths during the day and 8-tenths in the evening at the inlet of the consumer's meter. This might be sufficient for flat flame burners, but is not enough for burners of the atmospheric type, whether used on Welsbach lights, gas fires or cookers, and the engineer whose distributing plant is not equal to maintaining something like 15-tenths in all parts of the district at periods of maximum consumption, is likely to have a bad time of it. The experiences of the past fortnight are likely to lead to much serious consideration in connection with outlet pressures and the sizes of the leading mains from the works, and to suggest the desirability of some auxiliary means, such as high pressure feeding mains, for assisting the supply during the times of heavy consumption brought about by frost and fog. This consumption may be expected to increase year by year, and we seem almost within measurable distance of the time when the pressure of the holder will no longer be sufficient, but will require to be assisted by pumping in some form or other.

The New Year finds our industry in a state of all-round activity, and the confidence in its stability was never greater. The exhibition at Earls' Court, the success of which was simply phenomenal, and which was closed on the 17th ult., has not only been a lesson to consumers, but has also shown investors and directors something of the resources and capabilities of gas, with the result that there has been an all-round advance in the prices of gas stocks and shares, and that engineers who are hampered with a nervous, unenterprising or niggardly directorate will find less difficulty in obtaining the wherewithal for much needed improvements or extensions. In the introduction of machinery for transport of coal and other materials, or for the loading of coke, for the drawing and charging of retorts and other operations about a gas works that are at present conducted by more or less expensive and uncertain manual labor, there is such a marked advance that it is safe to prophesy that the next few years will see a remarkable alteration in the arrangements at large works, which is bound to penetrate down to establishments that do not at present appear large enough to warrant the introduction of machinery. Then there is very great activity in the incandescent department, especially as regards burners of the inverted type, but there is no very marked progress in improving the toughness or strength of mantles. The prevalence of mild weather has made the coke market somewhat weak, and tar is also in a low state, but sulphate appears fairly brisk. The demand for slot meters shows little signs of abatement, and the system maintains its popularity with both parties concerned. So that, taking things all round, there is every reason for satisfaction. The present season unfortunately seems to have been unusually disastrous in respect to casualties, fatal and otherwise. The extra heavy traffic at Christmastime is probably the cause of broken mains, and the practice of using 10 or 15-ton rollers on the thoroughfares of all our large towns, making the surface practically gas tight, facilitates gas travelling a considerable distance, it may be, through the subsoil, into the basement of any adjacent building. In London, gas found its way into a cottage occupied by a widow and family of five, in sufficient quantity to cause the death of two, and it was found that a gas pipe, 3 inches diameter, situated a distance of 16 feet from the frontage line of the building, was broken clean in half. The pipe was in good condition and laid 2 feet clear below the surface, and the only explanation of the fracture was that the soil had given way below it, throwing

the whole weight of the traffic upon the pipe. At Ponteprid a similar fracture was the cause of an explosion, which fortunately was not attended with serious personal injury. An elderly couple were found dead in their bedroom at Southport, and the fumes of a gas stove placed on a table and used as a source of warmth were blamed as the cause. But as the room was small and low, and the fireplace was blocked with a brown paper screen to keep out the cold, the gas was scarcely at fault in this case, and from the dimensions of the apartment one can scarcely wonder at the result, gas or no gas. At a small country gas works in Oxfordshire the manager lost his life apparently by an act of indiscretion. The station meter had been repaired and replaced on the previous day, but the gas was not turned into it. The deceased borrowed some matches and went into the meter house, and soon afterwards an explosion followed which wrecked the meter and building and so injured the unfortunate man that he succumbed within a few hours without regaining consciousness, so the exact cause is not known, but it may be assumed that he had turned the gas on to the meter and was under the impression that a sufficient quantity had passed through to clear out the air and avoid risk of explosion, and in that belief used a lighted match to test some of the joints.

Naphthaline still continues to claim a prominent share of attention, and no one I think, has yet been able to show such decisive results as those recorded by Mr. Colson, at Leicester. In that district, during the month of December, 1903, there was 2,500 cases of stopped service pipes, which entailed the employment of a small army of gasfitters and laborers, to say nothing of the annoyance and inconvenience caused to the customers, and the loss of sales due to many parties running along for some days or perhaps weeks with a deficient supply. But during December, 1904, under climatic and also working conditions that were more favorable to the formation of naphthaline, there were absolutely no complaints, no annoyance and the fitters turned over to more useful and more renumerative work. The process has been in operation now for over 7 months, and with uniformly effective results, so Mr. Colson's faith in his system has been borne out by actual facts, and naphthaline at Leicester appears likely to become as extinct as the Dodo. One of the latest contributions to the already bulking list of naphthaline cures is a fluid sold by a firm in Brussels under the name of "gazine," which is claimed to have given satisfactory results at Milan where the make is 1,400 millions per annum. The fluid is simply admitted into the outlet of the station meter, in the proportion of 2 grammes per cubic meter, which would mean about 2½ fluid ounces per 10,000 cubic feet, or 16 gallons per million. Apparently the fluid is volatile and vaporizes without leaving any residue. The expense would, of course, depend on the cost of the fluid and whether it can be depended upon to carry right through to the consumers' burners. Incidentally one would like to be assured that it is not likely to fraternize too freely with the oil on the leather diaphragms of dry gas meters.

The Earls' Court Exhibition was brought to a successful close on the 17th ult. Suggestions were not wanting that it should be held open for another week, or even till after Christmas, but fortunately these did not prevail, and the exhibition closed in good form before anyone had time to get tired of it. The result is that it made a very effective exit, which might not have been the case if it had been allowed to drag on for some time. The dates of opening and closing were announced well in advance, and everybody who really intended to go probably did so, and therefore an extension of time might have had the effect of putting a bad complexion on the whole thing. The promoters, the Committee, and the exhibitors all appear to be well satisfied and they certainly deserve the credit of having made the best possible use of the material at their disposal. The Manchester District Association of Gas Engineers are considering the question of holding a similar show at Manchester in the autumn of next year, but perhaps on a smaller scale, and the Secretary states that he has already received sufficient promises of support from exhibitors to warrant the carrying out of such a scheme. What one wants to know is how far the average consumer of gas will take the trouble to travel in order to inspect a good show of appliances. It would be interesting if the gas companies who issued free tickets to the customers would publish the results showing the percentage of tickets actually presented at the turnstiles.

Manchester is one of those places that is well situated in a geographical sense as regards the number of consumers that reside within about an hour's railway journey, and therefore the Manchester Association have good prospect of results as satisfactory as those at Earls' Court. Several suggestions have been made, and one is that a permanent arrangement might be made for the holding of a gas appliances exhibition every year and that the district associations might take the matter up in rotation year by year, selecting a suitable center in their respective districts, in which case each one would get a turn about once in 10 years and expenses could be met by a levy on each million cubic feet of gas made per annum by the gas undertakings within reach of the exhibition. If the leading firms of appliance makers are prepared to support such a suggestion the matter is certainly worth careful consideration, as an excellent means of keeping gas well in public view. Each show would be talked about at least over a considerable area outside its special district.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE Metuchen (N. J.) Gas Light Company has elected the following officers: Directors, Patrick Convery and L. C. Johnson, of Perth Amboy; John W. Whelan, L. A. Reitmeyer and Robert Carson; President, Patrick Convery; Secretary, Robert Carson; Treasurer, John W. Whelan.

THE proprietors of the Derby Gas Company, of Birmingham, Conn., have petitioned the Legislature for the right to increase its capital stock to $1,000,000.

THE new bench of 6's recently completed on the plant of the Dalton (Ga.) City Gas Works is said to be in successful operation.

MR. ALBERT E. REYNOLDS, formerly Assistant Secretary of the Denver (Col.) Gas and Electric Company, has been appointed Manager of the Company's coke department, vice the late Mr. W. J. Buell.

THE Wyandotte Gas Company, of Kansas City, Kas., has made a payment of $1,004.83 into the city treasury, representing the sum of 2 per cent. gross on its receipts for the 6 months ended January 1st. This is a gain of 20 per cent. over the previous return.

AT the annual meeting of the Evansville (Ind.) Gas and Electric Company the officers elected were: President, E. B. Lewis, Chicago; Vice-President, F. J. Reitz; Treasurer, James H. Foster; Secretary, W. B. McDonald.

THE proprietors of the Adrian (Mich.) Gas Company have purchased a very well located plot of land, which eventually will prove the site of the new works that it is proposed to build. The plot comprises all that part of Lawrence Park lying between the tracks of the Detroit Southern Railroad and Raisin river.

THE annual meeting of the shareholders in the Peoples Gas Light and Coke Company, of Chicago, Ills., will be held at 11 A.M. of the 10th prox.

A CORRESPONDENT in Boston, writing under date of the 21st inst., incloses the following: "At the annual meeting of the Directors of the Greenfield (Mass.) Gas Light Company the gross selling rate was reduced from $2.50 per 1,000 cubic feet to $2. The concession becomes effective February 1st. The semi-annual dividend of 3 per cent. on the preferred stock was declared, and it was voted to expend the dividend in the common stock and as much more as might be necessary in putting the plant in shape. Mr. George H. Priest, of Waltham, was elected Treasurer and Superintendent, succeeding Mr. A. R. Willard.

MR. PHILIP CROSS, the wide-awake and clever Manager of the New Business Department of the Denver Gas and Electric Company, of Denver, Col., still keeps at the public of Colorado's proudest (also largest) city. His last appeal and warning are to the following effect:

"We are going to do some pounding. This is the first pounder. We are going to keep on pounding until we have convinced you that every statement we make is a true one. We want to light your windows at night. There are an even score of good reasons why you should outline your windows with electric light. We want the chance of telling you the reasons. We are sending a postal card in this letter. Won't you please use it? We are confident you will be well paid for the few moments of your time you give our representative. Please use the postal card at once."

THE following is the matter that the postal card carries:

"DENVER GAS AND ELECTRIC CO.

"GENTLEMEN: Your letter in reference to electric light for my windows received. I am willing to be convinced. I will give two minutes of my time to one of your representatives. He may call ....." The necessary signature and address follow.

"A. F. C.," writing from Exeter, N. H., some days ago, said: "In your recent notes on calendars received I perceive that you congratulate our 'Fred.' Davis, of Waltham (and elsewhere) on the stage beauties. There has always been to my mind a close rivalry between 'Fred.' Davis, 'Harry' Norton and McKenny & Waterbury, in this section of New England. McKenny & Waterbury have been the pole horses with beauties (in undress uniform) for 2 years or more. This year's calendars, so far as received, show McKenny & Waterbury still holding the pole—beauty with two children. 'Harry' is a close second, and coming fast—beauty, with bare head and feet. 'Fred's' beauties are dressed. I also congratulate him. In fact, I congratulate them all. Their calendars are beauties and are appreciated. They come from our friends. The labor is theirs; the pleasure is ours."

A CORRESPONDENT in Los Angeles, Cal., writes: "Early this month the Los Angeles Gas and Electric Company began the extension of its gas main from South Pasadena to and through Alhambra City. The main will come down Garfield avenue and service will be extended, to a large part of the city before the spring season is with us. The principal streets along which a number of property owners have agreed to take gas will be first supplied. The Company will supply gas at 90 cents; in fact, under all or like conditions prevailing in Los Angeles. Alhambra is 7 miles from Los Angeles and will be supplied from the high pressure main now supplying gas (manufactured in Los Angeles) to Pasadena. Individual house regulators will be used."

MESSERS. SANDERSON & PORTER, of 52 William street, this city, Consulting Engineers and Contractors for the development of railway, light, hydraulic and power propositions, inform us that Mr. William R. King, C.E., has been admitted to membership in the firm.

THE Rensselaer Chamber of Commerce has appointed a committee to confer with the officials of the Albany and Hudson Railway and Power Company, respecting the securing of lower gas rates for East Albany and adjacent territory. The Company is successor to the old East Albany Gas Company.

THE new storage holder for the municipal gas plant at Holyoke, Mass., will be completed this summer. It is really a necessity for the safe operation of the plant.

AT the annual meeting of the Coldwater (Mich.) Gas Company, the following officers were elected: Directors, L. M. Wing, F. W. Moore, E. J. Allen, L. E. Rose, A. S. Upson, B. H. Calkins and H. C. Leveridge; President, L. M. Wing; Vice-President, H. C. Leveridge; Secretary and Superintendent, W. A. Combs; Treasurer, F. W. Moore.

"F. W.," writing from Grand Rapids, Mich., under recent date, says: "A syndicate of Grand Rapids business men, comprising Claude Hamilton, Henry Idema, E. A. Stowe, Guy W. House and Messrs. Child, Hulswit & Co., has purchased the plant and rights of the Cadillac (Mich.) Gas Company. The concern will be reorganized under the name of the Cadillac Gas Light Company. It is arranged that the purchase money and a fund for extensions and improvements will be paid out of an issue of $100,000 of bonds to run for 30 years. The subscriptions for the bonds will close Wednesday next, on which day the new management will assume control.

THE Brattleboro (Vt.) Gas and Electric Light Company will this year have the same officers who so capably conducted its affairs last year. The reports for the year showed an increase in output amounting to virtually 10 per cent.

MR. FRANK M. TRAVIS has been elected a Director in and Secretary of the Winsted (Conn.) Gas and Electric Company. Some good results are likely to follow in the management of the Winsted Company's affairs from the Travis connection therewith.

AT the annual meeting of the shareholders in the Savannah (Ga.) Gas Company the following executive management was named: Directors, Henry Blun, S. B. Adams, Randal Morgan, Walton Clark, Thos. Dolan, Samuel T. Bodine, George Philler, E. L. Brundrett, George S. Philler, James Bell, Lewis Lillie, W. S. Douthirt, W. J. Serrill, F. H. Mac Morris and J. A. P. Crissfield; President, Samuel T. Bodine; Vice-President, John W. Golden; Treasurer, Lewis Lillie, Superintendent, S. E. Linton, Jr.

THE following notice, which was issued this month by the Hartford (Conn.) City Gas Light Company, carries its own explanation:

"To our Patrons: Many people on our mains, though they do not use any appreciable quantity of gas, have installed in their residences or places of business meters which have to be periodically read, tested and cared for and regularly reported and recorded on our books. Each customer thus involves to the Company labor and bookkeeping charges without in return adding to the increase of business of the Company. To cover such cases it has been decided that hereafter a monthly service charge of 50 cents will be made to customers who do not use 500 cubic feet of gas in any month. Where 500 cubic feet of gas or more is used, no service charge will be made. This rule will appeal to the sense of justice of all, and will go into effect and be embodied in bills sent out March 1, 1905."

PRESIDENT F. E. CHANDLER, of the Malden and Melrose (Mass.) Gas Light Company, is quoted as saying that it is the intention and purpose of the Company to remove the manufacturing plant from its present location in Malden to the Wellington district of Medford. The proposed change seems in line with progress and good business policy.

WE understand that the City Council of Hoquiam, Wash., has granted a franchise for the construction and operation there of a gas plant, to Mr. C. E. Burrows and associates of Walla Walla. The scheme also includes the furnishing of gas to a nearby populous center known as Aberdeen.

THE final measures for the taking over of the properties and franchises of the Consolidated Gas and Electric Company, of Batavia, N. Y., by the Batavia Light and Power Company, have been arranged. The capital has been put at $100,000, and the Directors are: L. W. Warren, G. R. Howard, Peter Norton, E. O. McNair and B. B. Conable.

THE annual meeting of the Washington (D. C.) Gas Light Company will be held in that city at noon next Monday.

SENATOR LAKE has put before the Connecticut Legislature a resolution authorizing the Hartford City Gas Light Company to issue $1,000,000 bonds "for funding floating indebtedness and improving and extending its plant."

AT the annual meeting of the Galveston (Tex.) Gas Company the officers chosen were: Directors, J. H. Hutchings, Jno. Sealy, R. W. Smith, John C. Walker and Henry J. Runner; President, J. H. Hutchings; Vice-President, John Sealy; Secretary, A. J. Sealy; Superintendent, John H. Gimper.

IT is reported that Providence (R. I.) parties are attempting to secure control of the properties of the Woonsocket (R. I.) Gas Company.

AT the annual meeting of the Alpena (Mich.) Gas Light and Fuel Company the following executive management was named: President, Edward M. Deane; Vice-President, George Metz; Treasurer, Dwight Smith; Secretary, Frank Deane; Manager, James Trimble.

THE legislative correspondent of the Boston (Mass.) *Adrertiser*, writing under date of the 21st inst., says: "Ten gas bills were the most important, among the host of bills and petitions filed or introduced in the House yesterday. J. B. Moran is the author of all, and they relate to the Gas Commissioners' department, the purchase of plants by cities, the establishment of municipal plants, and for appeals from decisions under the Boston consolidated gas act. One provides that the Gas Commission shall be elected annually by the people, the Commissioners to serve for a term of 3 years, one to be elected annually; no person to be eligible for more than 2 terms; the present Board to be abolished forthwith; the Governor and Council to appoint a new Board to act until the Commissioners elected next November shall qualify. Another bill relates to the manner in which the Gas Commissioners shall determine the capital stock to be issued by the Consolidated Company requiring it to be based on the fair market value of the properties of the Companies and giving the right to any consumer to be heard. He also seeks to amend the law giving cities and towns the right to purchase lighting plants by requiring the corporation to file a detailed statement of the plant. He also seeks to amend the law so that a city can be authorized to purchase such plants by the vote of one City Council and the adoption of the proposal by a city election, and that the vote shall not be subject to the veto of the Mayor. He also asks for the repeal of the Boston Consolidated Gas Company act, and further that the Massachusetts Pipe Line Company be excluded from the consolidation."

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
MANAGER.

PUBLISHED ON EACH MONDAY OF THE YEAR AT
No. 42 Pine Street, New York.
Telephone, 2996 John.

MONDAY, JANUARY 30, 1905.

The Market for Gas Securities.

At the annual meeting of the Consolidated Gas Company the only change in the executive management was the naming of Mr. George H. Church to succeed the late Mr. W. C. Whitney as Trustee. The annual reports, as read by the Vice-President, Mr. W. R. Addicks, contained many interesting figures, not the least interesting of which, that after many days of woe, showed that the Company had been able to lay aside a surplus of $2,600,000 for the twelve-month. Those who opposed the Remsen "gas grab" will be pleased to know that the Company will, in the next year or so, be able to hook up its new Astoria plant with its Ravenswood station and send gas through the initial tunnel under the East river at almost any rate that Odell & Co. may demand. The stock seems in good demand, despite the inchoate state of investigation, State and otherwise, that the legislators are inspiring. The closing today (Friday) was 202½ to 202¾. It looks a purchase, with Mr. Goodsell and Mr. Apgar in charge of the dangerous section.

Brooklyn Union is neglected (the same may be said of Kings County Electric Lighting), at 204 to 208. We suppose, however, that the electric lighting and gas conditions in New York and Brooklyn differ somewhat. Messrs. Brady & Co. undoubtedly know. The general gas share market is rather more than steady, despite legislative activity on rate accounts and the like, in places where legislative troubles are expected at this time of year. Chicago is 107 to 107½, and Baltimore Consolidated is 84½ to 86, with the gas end there still holding its own, if not a trifle more. Washington (D. C.) is 317½ bid.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

JANUARY 30.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$78,177,000	100	202¼	202½
Central Union, Bonds, 5's	3,000,000	1,000	108½	110
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	118	120
Mutual	3,500,000	100	300	320
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co..				
Bonds, 5's	11,000,000	1,000	112	113½
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	35	.
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	..	.	.
Northern Union, Bonds, 5's.	1,250,000	1,000	104	106
New York and East River..				
Bonds 1st 5's	3,500,000	1,000	112	114
" 1st Con. 5's	1,500,000	..	106¼	108½
Standard	5,000,000	100	125	130
Preferred	5,000,000	100	145	155
Bonds, 1st Mortgage, 5's	1,500,000	1,000	116	117
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	204	208
" " Bonds (5's)	15 000,000	1,000	113	115
Bay State	50,000,000	50	—	—
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	28	30
" 1st Mtg. 5's	509,000	1,000	93	96
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	5¾
" " Bonds, 5's	5,250,000	1,000	68	68½
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas and Electric Co	29,500,000	100	107½	108
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	97½	99
Columbus (O.) Gas Lt. & Heating Co	1,682,780	100	88¼	89¼
Preferred	3,026,500	100	107½	109
Consumers, Toronto	,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	84½	86
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
" Con. Mtg. 5's	880,000	1,000	89½	92
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50	..	50
" Prior Lien 5's	5,603,000	1,000	99½	100
Detroit Gas Co., 5's	351,000	1,000	75	75½
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,235,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	104½	105½
" Bonds, 5's	10,500,000	..	107	108
Indianapolis	2,000,000	..	70	75
" Bonds, 6's	2,650,000	..	106½	108
Jackson Gas Co	250,000	50	82	..
" 1st Mtg. 5's	290,000	1,000	101	102¾
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,332,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	..	..
Preferred	2,500,000	100	90	105
Bonds	10,000,000	1,000	108½	109
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	136	140
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	350,000	1,000	107½	108¼
" 6 per cent. scrip, due 1910	100,000	25	85	87
Montreal, Canada	2,000,000	100	218	218¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	4,000,000	..	105	105¾
New Haven	2,000,000	25	200	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	106¾	107
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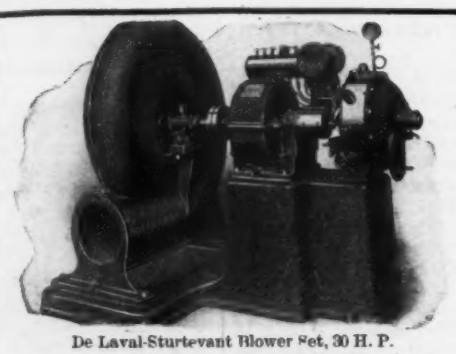
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Chrome, Magnesia, and Silica Brick,

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We Carry in stock constantly at our various works a complete line of shapes in the following well-known brands:

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CLEARFIELD,
WIGTON STEEL,
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MUNRO
EUREKA,
TYRONE,
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THE only distinctly new design of Gas Arc produced since the original Humphrey gave its powerful impetus to Commercial Gas Lighting and inaugurated a new business era. Our new lamps broaden the field.

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The "Air-Light"

Premier Burner Of America.

GENUINE "AIR-LIGHTS,"

A NEW BURNER FOR 1905.

AGENTS WANTED EVERYWHERE.

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A High-Class Burner, a Rapid Seller, and a Money Maker for Agents, Dealers, Gas Companies, etc.

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By THOMAS NEWBIGGING, M. INST. C.E.

This Edition of the "Handbook for Gas Engineers and Managers" is a great improvement on all previous editions. Much of the text has been re-written, in order to keep the work abreast of the constant advances that are being made in the Gas Industry.

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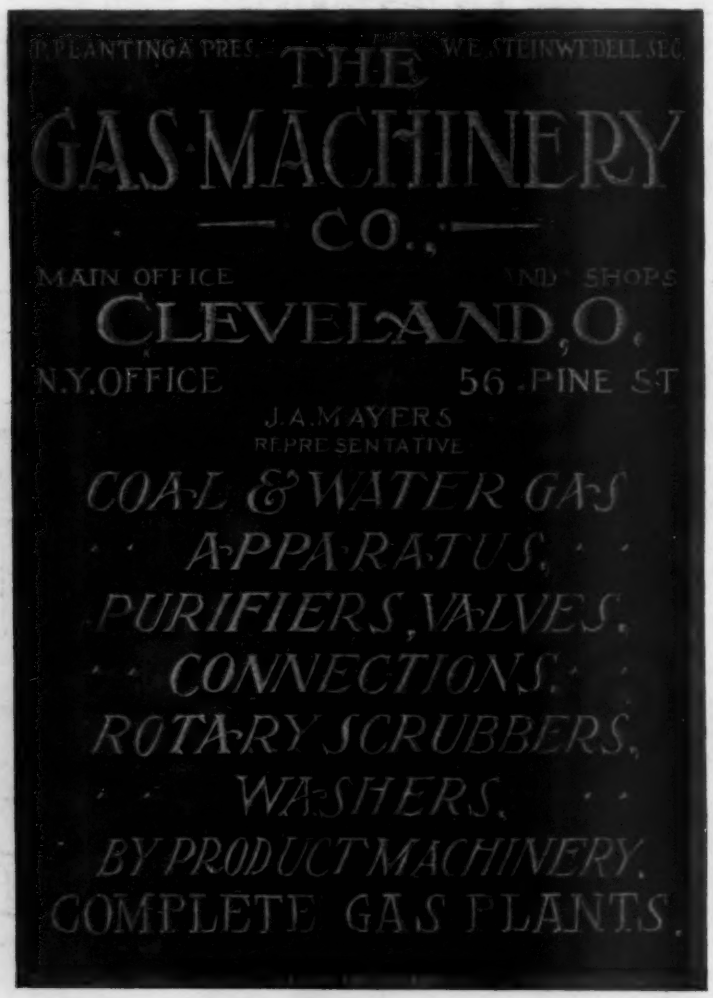

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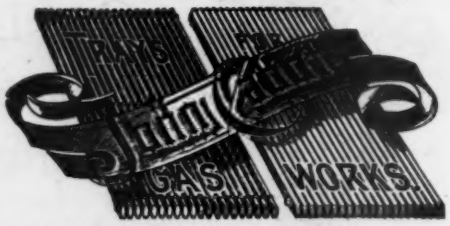

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Globe Street and Boulevard Lamps.

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THOUSANDS IN USE WITH INCANDESCENT BURNERS.

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Analyses of Solid and Liquid Materials as Well,

That are needed by Gas Companies at any time in the conduct of their business, may be obtained from

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This is No. 2.

Height, 36 inches.
Diameter, 12 "
Shipping weight, 80 lbs.
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The products of combustion are entirely separate from the water. Entire water surfaces are tinned.

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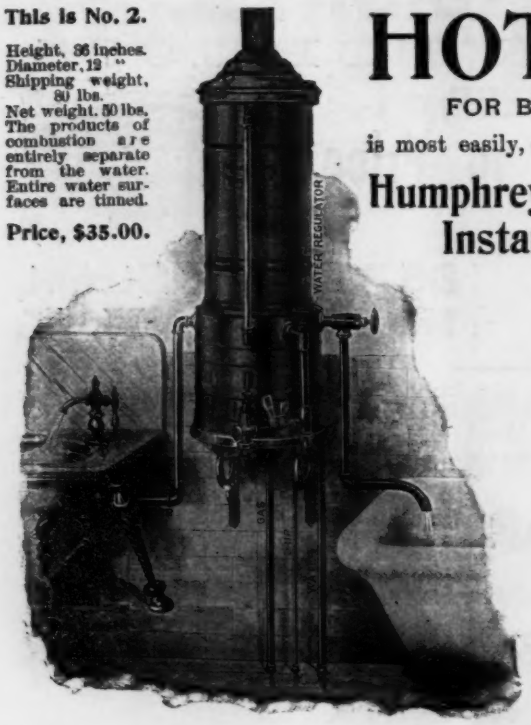

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FOR BATHROOM AND KITCHEN

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Are Used Everywhere,

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Double and Single Gate Valves, ⅜" to 72",

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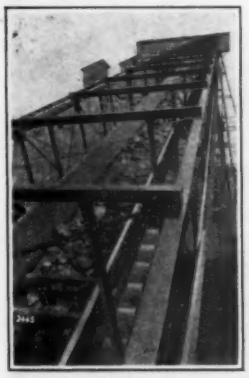

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(357' centers), handling run-of-mine coal from mouth of shaft to breaker, at rate of 500 tons per hour. Erected 1902 for Penna. Coal Co., No. 14 Breaker, Plains Junction, Pa.

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"Low cost may mean high operative cost—higher cost may mean low operative cost."

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An Analysis of the Principal Gas Undertakings in England, Scotland and Ireland. Being the 35th year of publication. Compiled and arranged by JOHN W. FIELD, Sec'y and Gen. Mgr. of The Gas Light and Coke Company, London. Price, $5., For Sale by

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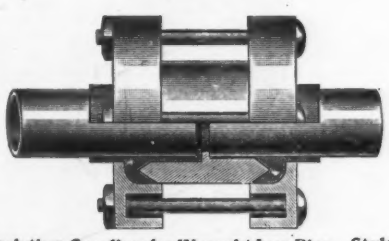
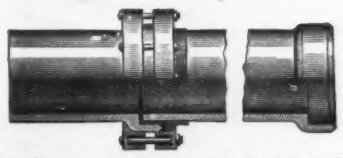


Insulating Coupling for Wrought Iron Pipe. Style 5.



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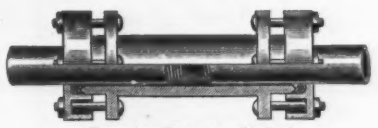
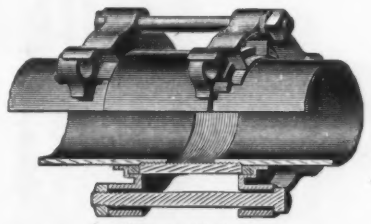
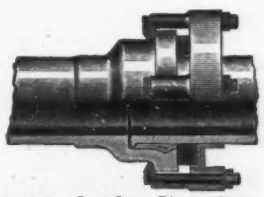


Regular Sleeve. Style 2.



Clamp. Style 4.



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Pipe Couplings, Sleeves, Clamps, Crosses, Tees and Ells.

My Insulating Coupling prevents the destruction of pipe by electrolytic action, in either water or gas lines.

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ARE YOU MARRIED to any other burner?

If not, please give us an opportunity to get your orders. Tell us what your pressure is and we will send you samples which we know will please you. Steward Burners are made for 8-10, 12-10, 15-10, 20-10, 25-10 or 30-10 pressure, and in sizes from 2-foot to 8-foot.

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A pipe jointer with detachable clamp often has the clamp detached and lost, rendering the jointer useless when it is wanted most.

Mueller Pipe Jointers are always ready for use. The clamp is permanently attached to the jointer by an easy working rivet hinge, so that in putting away or getting one part the other is sure to be with it.

Mueller Pipe Jointers are made for all sizes of cast iron pipe from 2 to 48 inches. The illustrations show the jointer closed as upon the pipe and open as ready to put on.

Each jointer is carefully inspected and assembled, is measured to actual pipe diameter, bears the Mueller trade mark, and is *unconditionally guaranteed.*

We also make tapping machines, gas cocks and meter connections for gas works' use. Catalogues upon application.

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GOLD MEDAL AT ST. LOUIS, 1904.

Installation showing our latest improved machines, with flexible rope coupling, for large units.

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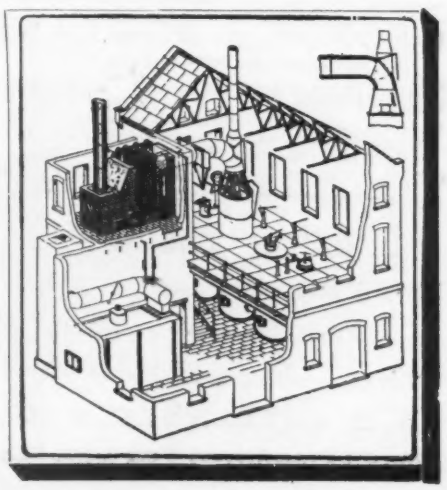
Do you know That there is from **30 per cent.** to **45 per cent.** of heat, from coal used in making water gas, escaping via the stack valve unless your plant is equipped with

GREEN'S Steam Fuel ECONOMIZER



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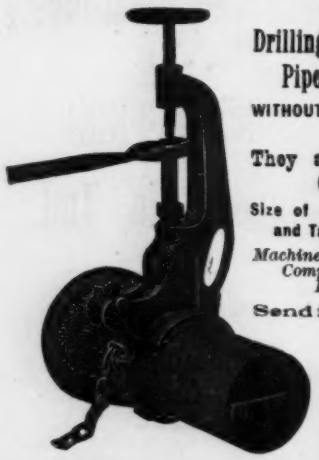

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Drilling and Tapping Pipe under Pressure

WITHOUT ANY ESCAPE OF GAS.

They are Strong and Compact.

Size of Combination Drills and Taps ¾ to 4-inch.

Machines Sent to any Gas Company for Thirty Days' Trial.

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Price, - - - - $3.00.

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FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF

Flange Pipe for Sugar House and Mine Work. Branches, Bends, Retorts, etc., etc.

NO LEAKY JOINTS IN **UNIVERSAL PIPE.**

Specially adaptable for—
High and Low Pressure Gas Mains.
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For Shutting Off Gas in Mains Temporarily during alterations and repairs. : : : :

Any size gas main can be shut off in 30 seconds. : : :

STOPPERS SENT ON TRIAL.

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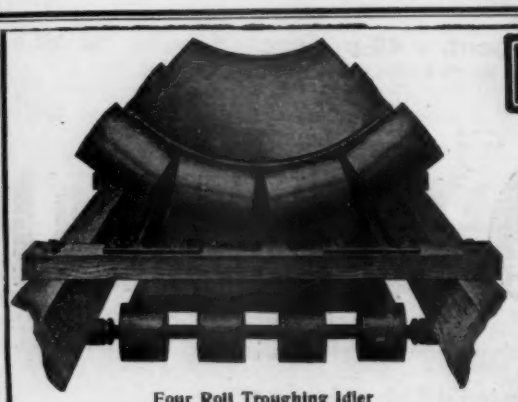
STATIONARY, SHAKING, DUMPING.

BARS FOR HAZELTON BOILERS.



Four Roll Troughing Idler
FOR WIDE BELTS.
The positions of the rolls conform to a natural and uniform curve of the belt.

BELT CONVEYORS

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BALL BEARING ROLLS

Possess greater efficiency, consume less power, and the belts last much longer than when any other type of roll is employed.

Permit us to tell you why and to submit plans and estimates.

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NEW YORK, ST. LOUIS, PHILADELPHIA, SAN FRANCISCO, CHICAGO,

Photometrical and Experimental Apparatus.

PUBLIC LIGHTING TABLE.

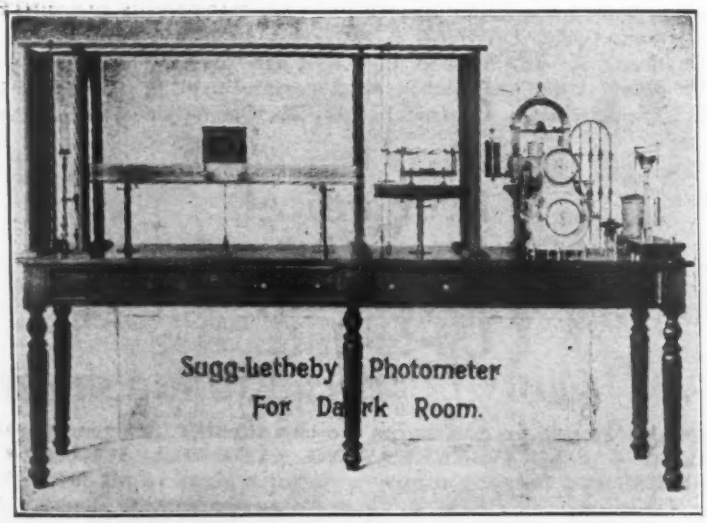
FEBRUARY, 1905.

Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.
Wed.	1	5.50 PM	6.10 AM
Thu.	2	5.50	6.10
Fri.	3	5.50 NM	6.10
Sat.	4	5.50	6.10
Sun.	5	5.50	6.00
Mon.	6	5.50	6.00
Tue.	7	5.50	6.00
Wed.	8	8.30	6.00
Thu.	9	9.30	6.00
Fri.	10	10.30	6.00
Sat.	11	11.20	6.00
Sun.	12	12.20 AM FQ	5.50
Mon.	13	1.20	5.50
Tue.	14	2.10	5.50
Wed.	15	3.10	5.50
Thu.	16	4.00	5.50
Fri.	17	4.50	5.50
Sat.	18	No L.	No L.
Sun.	19	No L. FM	No L.
Mon.	20	No L.	No L.
Tue.	21	6.10 PM	9.10 PM
Wed.	22	6.10	10.30
Thu.	23	6.10	11.40
Fri.	24	6.10	12.40 AM
Sat.	25	6.10 LQ	1.50
Sun.	26	6.20	2.50
Mon.	27	6.20	3.40
Tue.	28	6.20	4.40

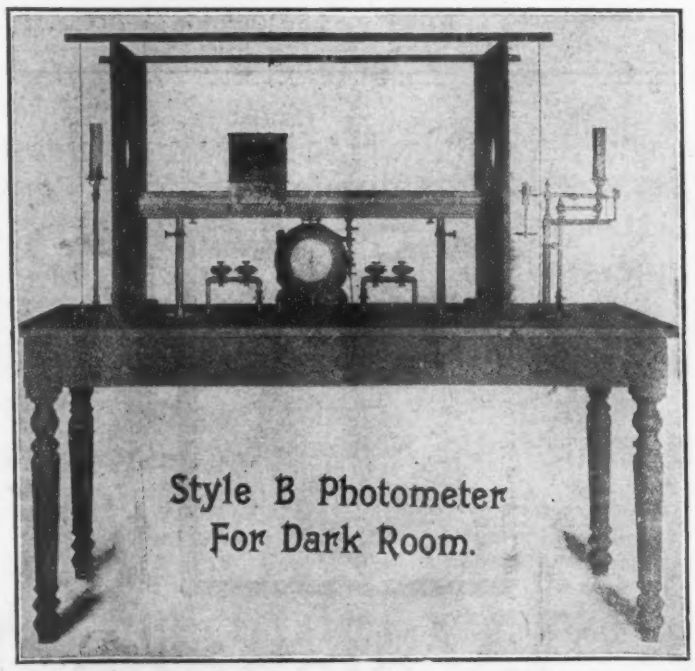
TOTAL HOURS DURING 1905.

By Table No. 1.

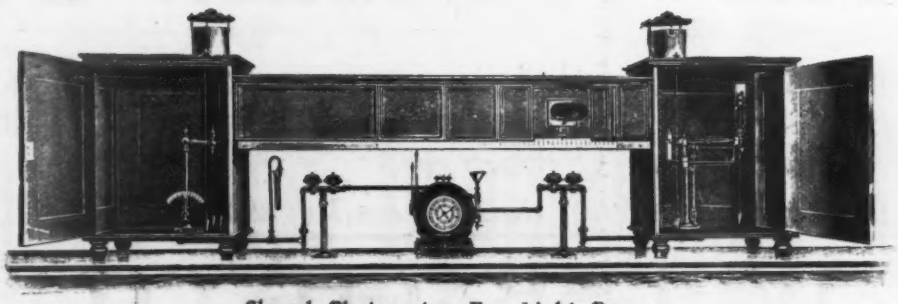
	Hrs.Min.
January	240.50
February	192.20
March	207.00
April	175.10
May	161.00
June	139.50
July	149.00
August	161.50
September	173.00
October	205.00
November	211.00
December	229.00
Total, yr.	2245.00



Sugg-Wetheby Photometer For Dark Room.



Style B Photometer For Dark Room.



Closed Photometer For Light Room.

CIRCULARS SENT ON REQUEST.

PUBLIC LIGHTING TABLE.

FEBRUARY, 1905.

Day of Week.	Date.	Table No. 2. NEW YORK CITY. ALL NIGHT LIGHTING. Light.	Extinguish.
		A.M.	P.M.
Wed.	1	5.05	6.15
Thu.	2	5.05	6.15
Fri.	3	5.05	6.15
Sat.	4	5.05	6.15
Sun.	5	5.10	6.10
Mon.	6	5.10	6.10
Tue.	7	5.10	6.10
Wed.	8	5.10	6.10
Thu.	9	5.10	6.10
Fri.	10	5.10	6.10
Sat.	11	5.10	6.10
Sun.	12	5.20	5.55
Mon.	13	5.20	5.55
Tue.	14	5.20	5.55
Wed.	15	5.20	5.55
Thu.	16	5.20	5.55
Fri.	17	5.20	5.55
Sat.	18	5.20	5 55
Sun.	19	5.30	5.55
Mon.	20	5.30	5.55
Tue.	21	5.30	5.55
Wed.	22	5.30	5.55
Thu.	23	5.30	5.55
Fri.	24	5.30	5.55
Sat.	25	5 30	5.55
Sun.	26	5.30	5.45
Mon.	27	5.30	5.45
Tue.	28	5.30	5.45

TOTAL HOURS DURING 1905.

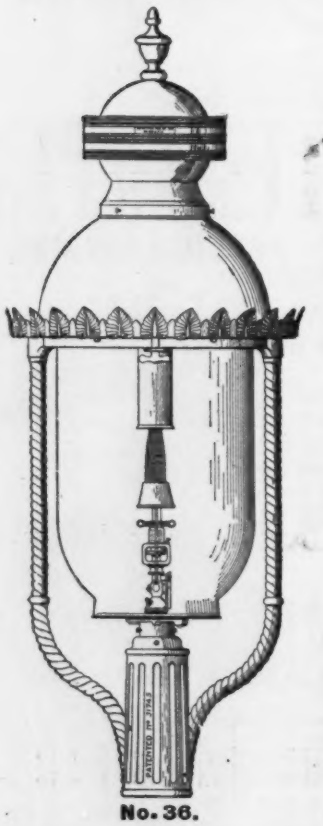
By Table No. 2.

	Hrs.Min.
January	423.20
February	355.25
March	355.35
April	298.50
May	264.50
June	234.25
July	243.45
August	280.25
September	321.15
October	374.30
November	401.40
December	433.45
Total, yr.	3987.45

NEW YORK, 97 Liberty Street. BOSTON, 814 Beacon Building. PHILADELPHIA, Broad and Arch Streets. ST. LOUIS, 712 Roe Building. CHICAGO, Foot of Orleans Street. SAN FRANCISCO, 712 Polk Street.

WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....



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Controls and Operates the

Welsbach System of Street Lighting,

Which includes its specially DESIGNED AND PATENTED BURNER for STREET and PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others interested in Municipal and Outside Lighting.

No. 38.

AN underlying principle in business is to show an increase each year---to grow. The astute dealer not only seeks to retain this year's customers, but to attract new trade next year.

The formula is simple---

THIS SHIELD IS THE WELSBACH TRADE MARK.

IT IS A GUARANTEE AND A PROTECTION.

Sell The Welsbach Brands.

The imitation stuff is bad for the customer---which is bad for you.

The genuine Welsbachs---Burners or Mantles---make satisfied customers---keep customers---MAKE NEW ONES.

And your profit isn't merely dollars and cents.

WELSBACH CO.,

Broad and Arch Sts., PHILADELPHIA.

THE UNITED GAS IMPROVEMENT COMPANY

For the Period Ending July 31st, 1904, has been Awarded Contracts in the Following Places for

Standard Double-Superheater Lowe Water Gas Apparatus.

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Bangor, Pa.	Westchester, N. Y. (3d contract).
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Brooklyn, N. Y. (4th contract).	St. Paul, Minn. (2d contract).
Cincinnati, O. (2d contract).	Harrisburg, Pa.
Scranton, Pa. (3d contract).	Pelham, N. Y.
New York City (14th contract).	Reading, Pa.
New Haven Conn. (2d contract).	Springfield, Mass. (2d contract).
Watertown, N. Y.	Lynn, Mass. (5th contract).

TOTAL SETS, 1904, ... 35
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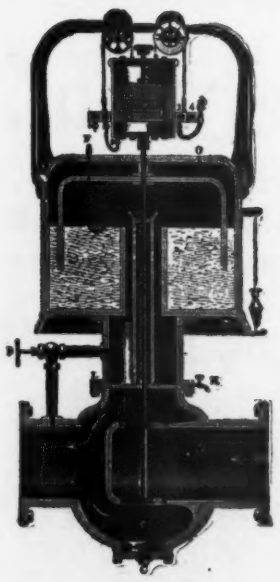

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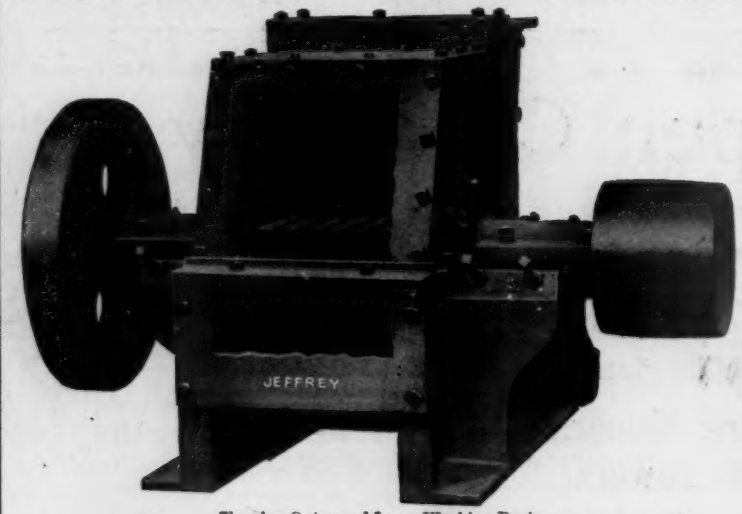

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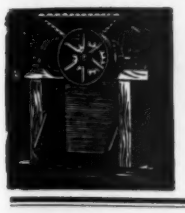

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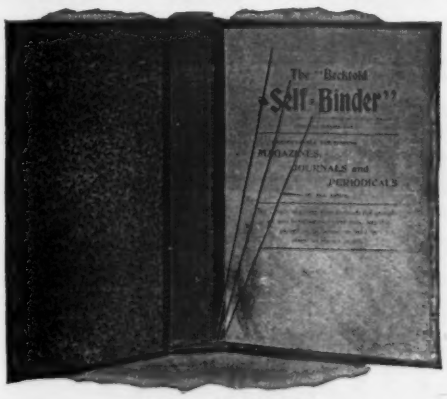

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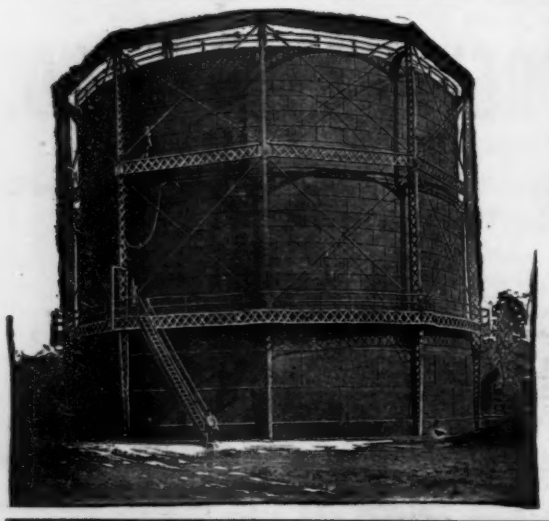

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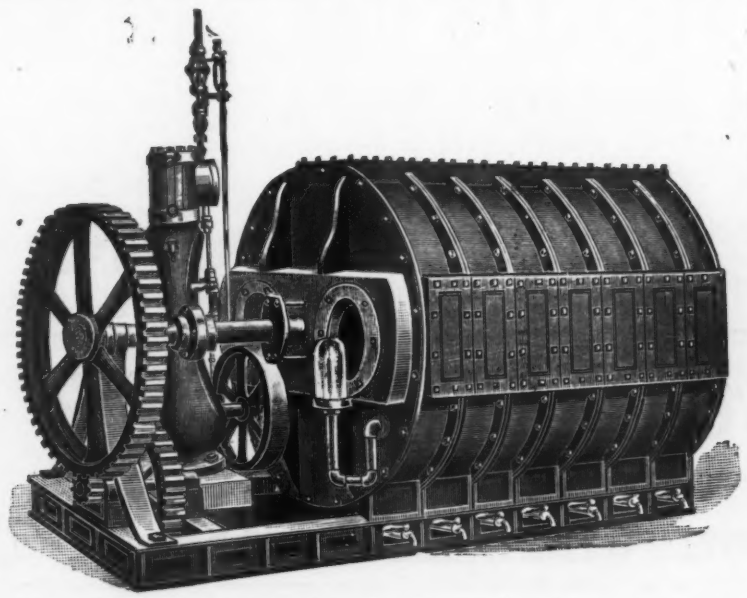

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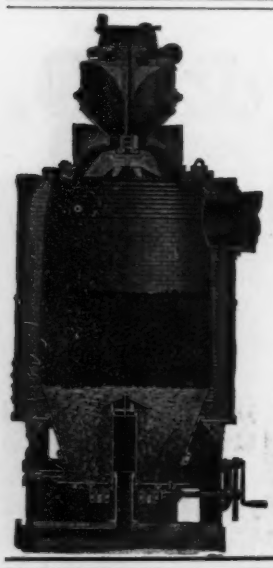

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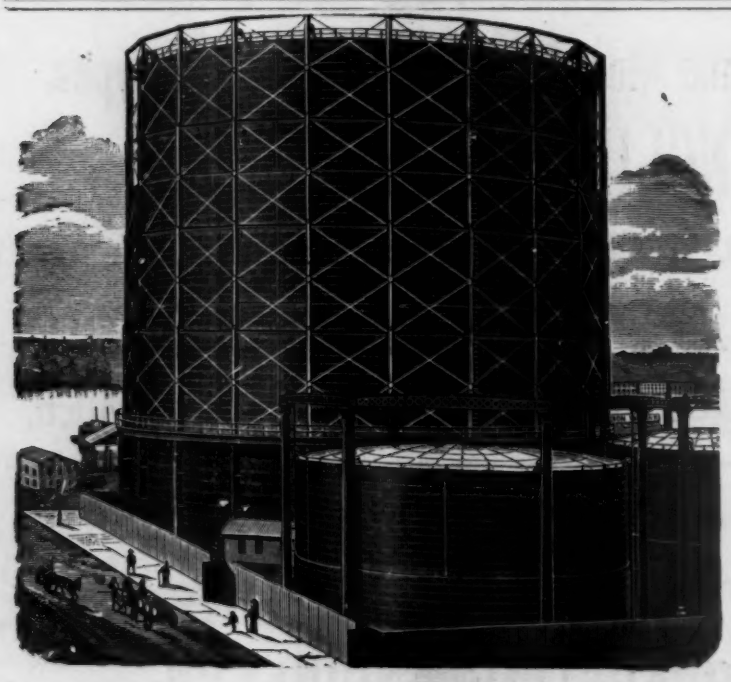

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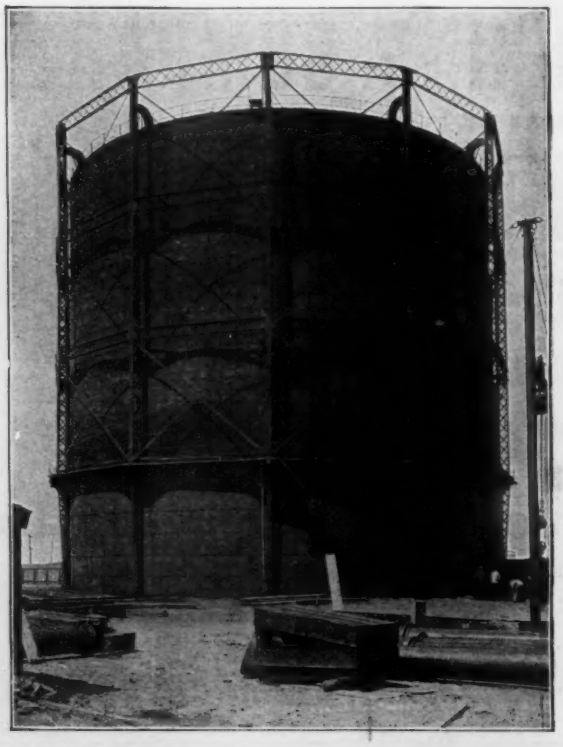

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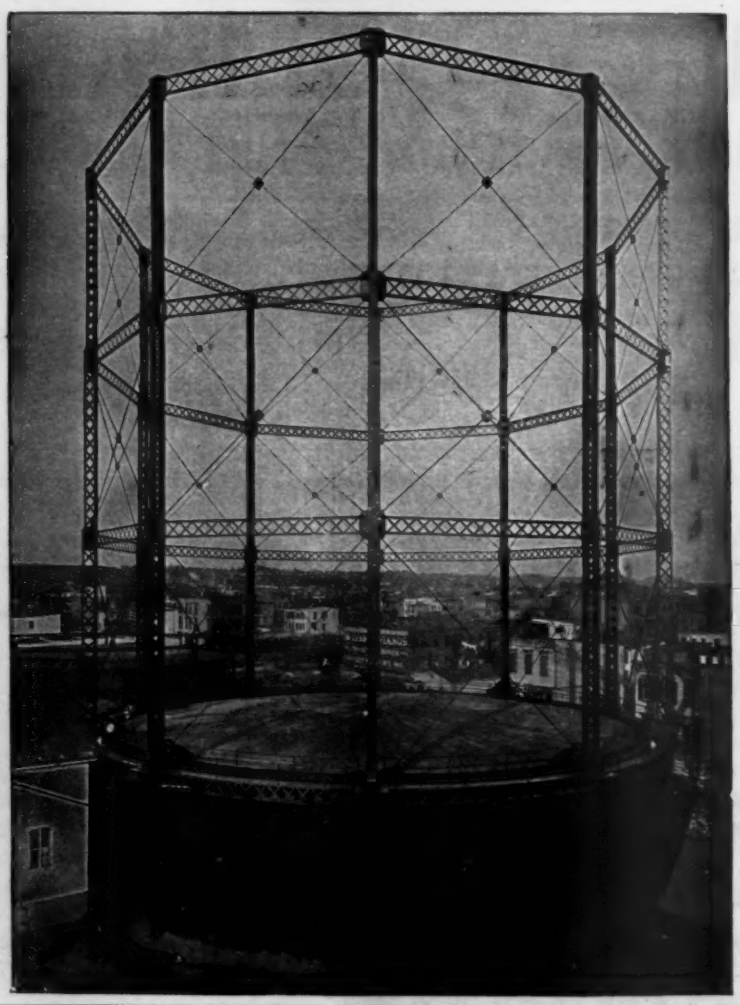

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—OF THE—

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MR. E. H. YORKE, NEW HAVEN, CONN., Dec. 1, 1898.

Dear Sir:—I am in receipt of a copy of "Excerpts from the Decisions of the Board of Gas Commissioners," which is a handy compilation in book form of extracts from the most recent decisions of the Gas Commission of Massachusetts.

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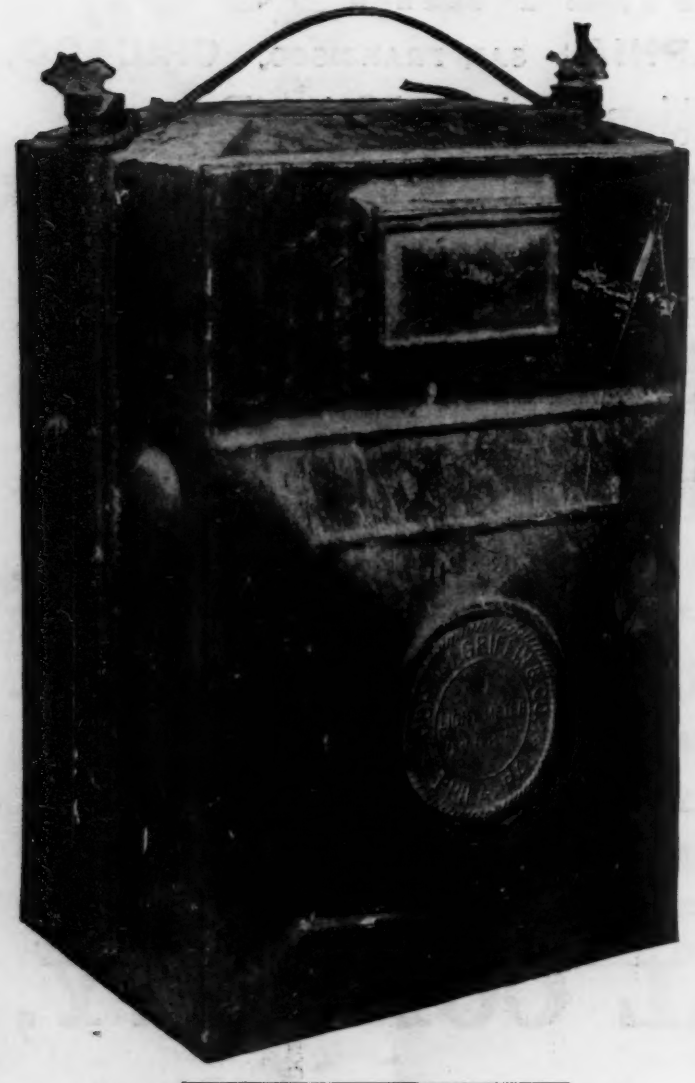

This is a photograph of a 3-light regular meter out of a lot of meters received from the Coatesville Gas Co., Coatesville, Pa., to be repaired and converted into prepayment meters.

AFTER.

This is the same meter after it has been repaired and converted into a new prepayment meter.

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